

The technicalities matter a lot, but the  
unifying vision matters even more  
— T. Nelson

The soul is greater than the hum of its parts  
— D. R. Hofstadter

The introduction of the use of the **Internet** into education may prove to be an event as epochal as the application of the principle of the wheel to transportation or the application of steam power to the industrial age.

A bit about me

... my  
dream





My collaborator &  
friend



# Technology & Education

What do teachers need to know?



The introduction of the use of the **Internet** into education may prove to be an event as epochal as the application of the principle of the wheel to transportation or the application of steam power to the industrial age.



>



or





I lied

The introduction of the use of  
the ~~Internet~~ **talking picture** into education  
may prove to be an event as  
epochal as the application of  
the principle of the wheel to  
transportation or the  
application of steam power to  
the industrial age.

Devereux, F.L. (1933). The educational talking picture.  
Chicago, IL: The University of Chicago Press.

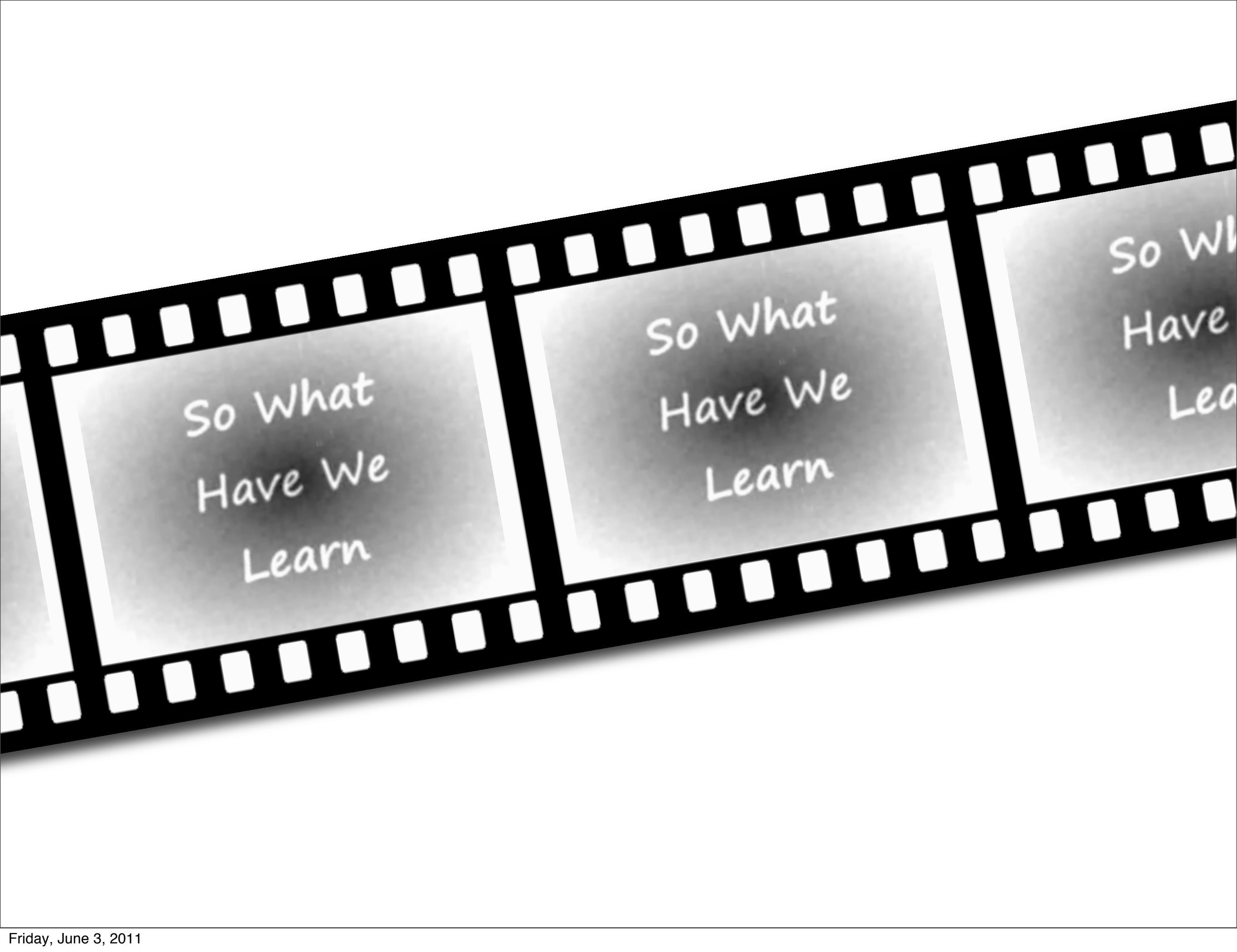


>



or





So What  
Have We  
Learn

So What  
Have We  
Learn

So W  
Have  
Lea



# Humility!

# 21st Century\*

\* already a decade into it





Ministry of Education  
SINGAPORE

# Nurturing our Young for the Future

Competencies for the 21<sup>st</sup> Century



# 21ST CENTURY KNOWLEDGE AND SKILLS IN EDUCATOR PREPARATION

September 2010



This paper has been produced as part of a collaborative project by the American Association of Colleges of Teacher Education and the Partnership for 21st Century Skills (P21).

Funding for the project was generously provided by Blackboard, ETS, Intel, National Education Association, Microsoft and Pearson.

1. The goal: To provide all students with 21st Century education
2. Redesign of TE programs based on collaboration between Higher Ed, schools, & communities (each organization to develop 21st Century blueprint to meet needs of learners)
3. Teachers & Admin will **possess, teach and assess 21st Century Skills/Knowledge**
4. New teachers as agents of change - for all subjects and all grades - possess, teach and assess 21st Century Skills/Knowledge
5. TE programs will be sources of leadership, research and evaluation on 21st Century Skills/Knowledge

# 21st Century Skills/Knowledge


## What are they?




# Google


21st century learning


About 23,200,000 results (0.23 seconds)

 Everything

 Images


 Videos


 News

 Shopping


 Books

 Blogs


 More

► [The 21st Century Learning Initiative](#) 


Oct 1, 2010 ... "These are confusing times... We know we have to do something, but what exactly?" What the **21st Century Learning Initiative** is all about. ...  
[www.21learn.org/](http://www.21learn.org/) - [Cached](#) - [Similar](#)

[The Partnership for 21st Century Skills - Framework for 21st ...](#) 

The Framework presents a holistic view of **21st century** teaching and learning that combines a discrete focus on **21st century** student outcomes (a blending of ...  
[www.p21.org/index.php?option=com\\_content&task...id...](http://www.p21.org/index.php?option=com_content&task...id...) - [Cached](#)

[The Partnership for 21st Century Skills - Home](#) 

By attending the Program, participants will leave with a firm understanding ...  
[www.p21.org/](http://www.p21.org/) - [Cached](#)

 [Show more results from p21.org](#)



21st Century Learning?

But what does this 21st  
Century Learning look  
like?

## ***21st Century Resources To Enhance Student Learning***



Wikis/ Blogs

Social Networking

Web 2.0

### *So You Can Surf...Now What? Web 2.0*



Web 2.0 is the latest version of the web where users are interacting and collaborating real-time. Participants will be presented with the best Web 2.0 free resources and websites, as well as ideas for implementation into both their classrooms and personal lives. They will be able to identify the characteristics of a Web 2.0 resource, demonstrate an understanding of Web 2.0 and its uses by brainstorming on how they can be incorporated into the classroom. Participants will also learn to use the information provided to access free resources and websites designed with students and teachers in mind and explore the 21st Century Resource page for hands-on Web 2.0 experiences.





2009

## Googlios: A 21st – Century Approach to Teaching, Learning, & Assessment

By Jose Rodriguez · December 18, 2009 ·  Email this post ·  Print this post · [Post a comment](#)

**Presenter:** G. Alex Ambrose

**Location:** South Bend, Indiana, USA

[Link to presenter's K12Online Ning Profile page](#)

**Presentation Title:** Googlios: A 21st – Century Approach to Teaching, Learning, & Assessment

**Presentation Description:** As the first decade of the 21st century comes to end and blogs, wikis, and podcasts have become more mainstream, it is important that educators step back to see how we, as professionals, are best using these tools to serve our students' learning needs. If these modern technologies are going to be sustained in contemporary pedagogy, it is time that we "kick it up a notch."

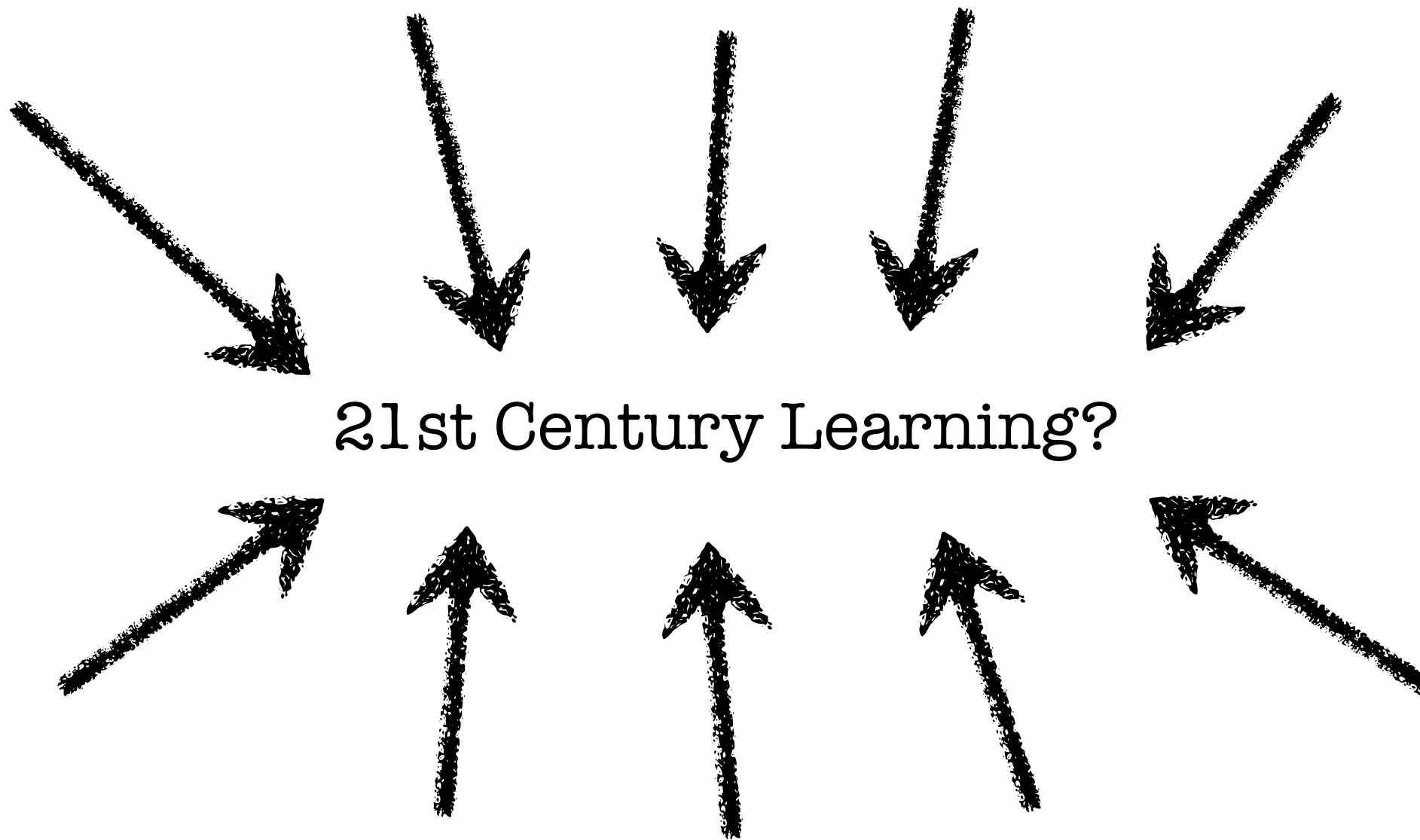
# 21st Century PD is on wikis

I am becoming convinced that all, or at least most, of the professional development sessions we participate in as educators and share with others should be organized via linked wikis. Dean did a great job modeling this last month in his [multi-day digital storytelling workshop](#). I attempted this in June when I organized several workshops with teachers in College Station, Texas (Bryan ISD) [focused on digital literacy](#)— primarily the use of blogs and podcasts to help teachers develop both traditional and 21st century literacy skills. I started a [blogging tools wiki](#) a few weeks ago after [an engaging skypecast on this topic](#). At the 2006 conference I attended 2 weeks ago in Winfield, Kansas [utilized a conference wiki](#) that a fair number of folks have contributed to successfully.

So, why all this educational wiki-use? I think the answers are pretty straightforward:

1. Wikis are collaborative, and one of the ideas we want students and teachers to both understand and LIVE is the idea that groups of people can come up with better ideas and solutions than people working in isolation.
2. Wikis are iterative, meaning that they improve over time. They are not a single snapshot or a static creation, but rather a dynamic, living creation that continues to grow as ideas change and evolve over time.
3. Wikis are free. As teachers, we like free stuff. And wikis don't cost anything to create in our present climate of abundant web 2.0 free tools.
4. Wikis are RSS subscribable, which makes them easier to track and update. More information services in the coming years will embrace RSS for this reason: Pulling information of interest to you is much more preferable than having information PUSHED to you that may or may not be desired.
5. We learn best by experiencing pedagogy and technology: Using wikis permits teachers to take on the role of learners, and directly experience how simple wikis are and can be for instruction— and especially group work.
6. Wikis are fast to create and update. I've been making webpages to accompany my educational technology workshops since the mid-1990s, and I've never used anything as fast and easy as a wiki. Yes, using a tool like Dreamweaver I can create a website, but it's many more bells and whistles than I need. Education should generally be more on CONTENT and IDEAS rather than bells and whistles. Attendees and our own students may lose sight of the





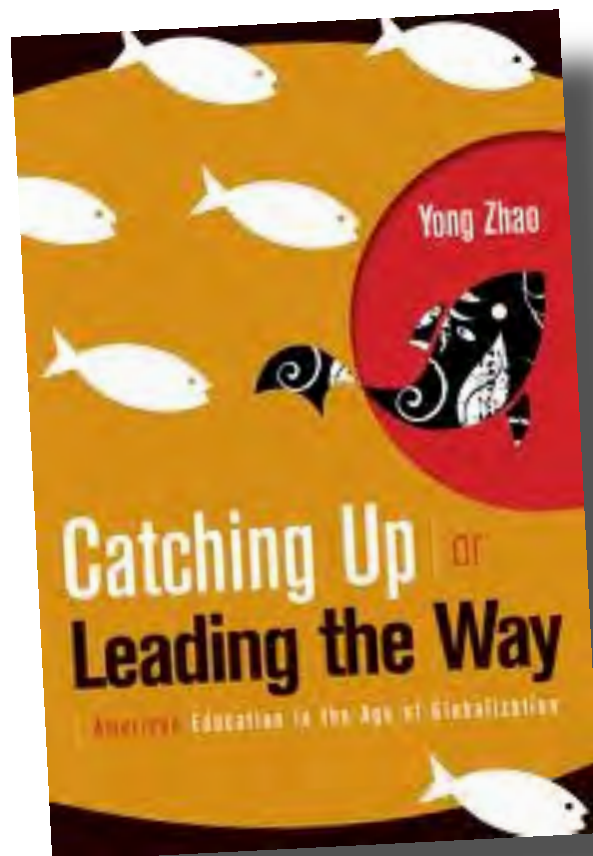
21st Century Learning?

# A synthesis

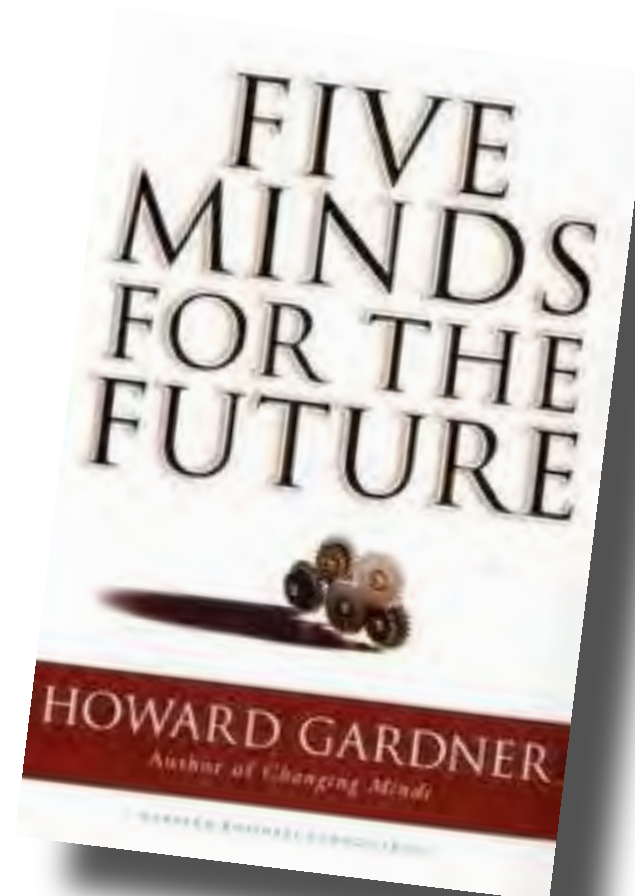
Disclaimer: We couldn't  
include all 23 Million  
Google hits

# 21st Century Thinkers

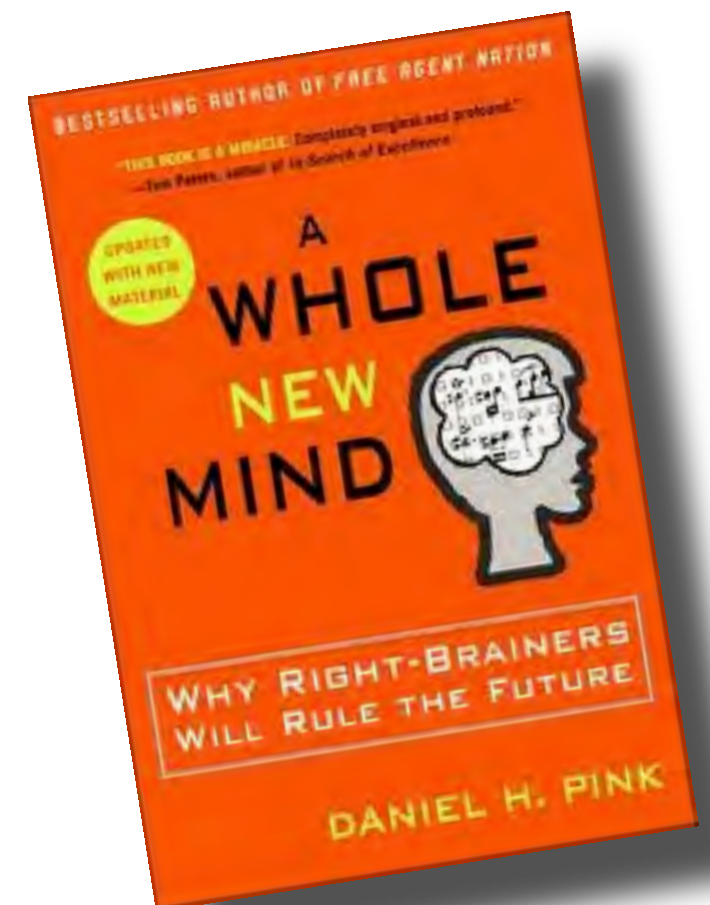
Yong Zhao



Howard Gardner

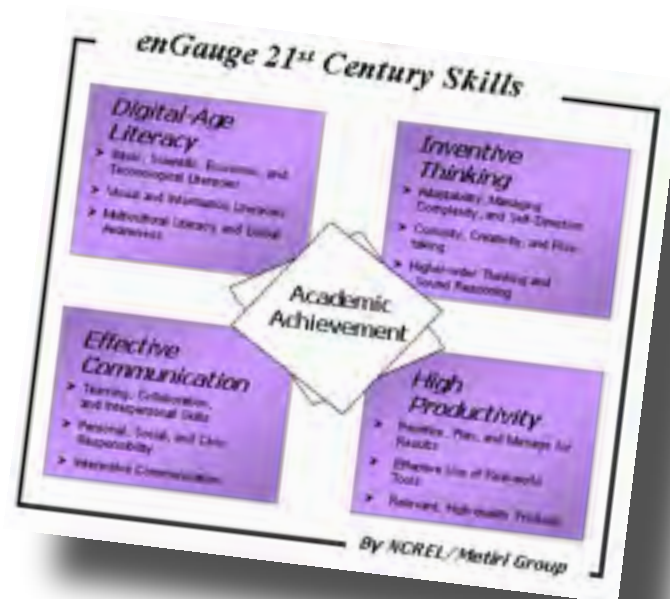


Daniel Pink



# 21st Century Organizations

Metiri Group



Partnership for  
21st Century  
Skills

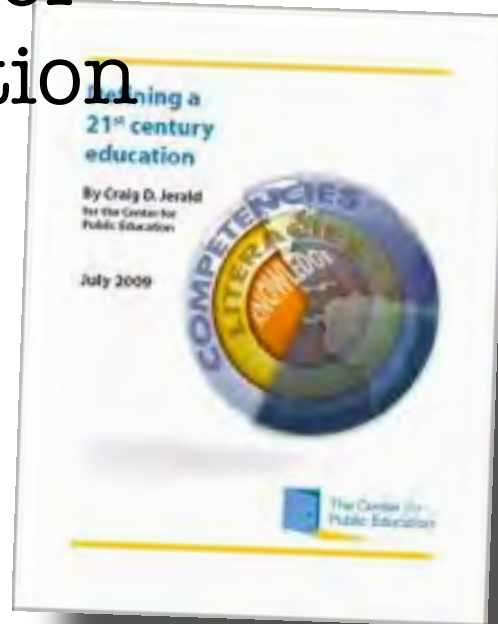


Organization for  
Economic  
Cooperation and  
Development

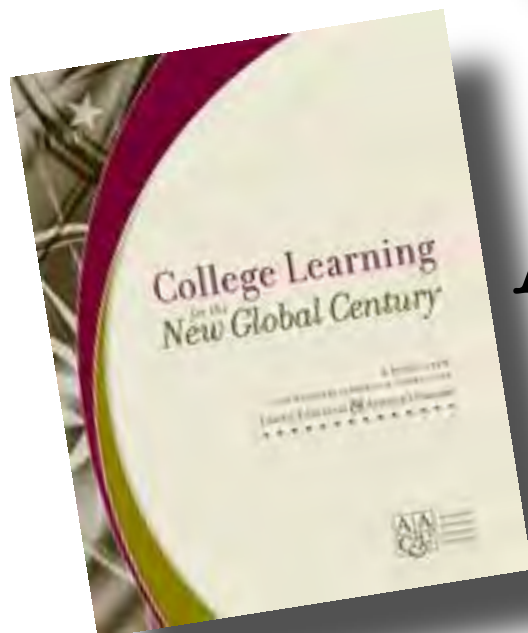


# 21st Century Organizations

The Center for  
Public Education



International  
Society for  
Technology in  
Education



American  
Association of  
Colleges and  
Universities

European Union

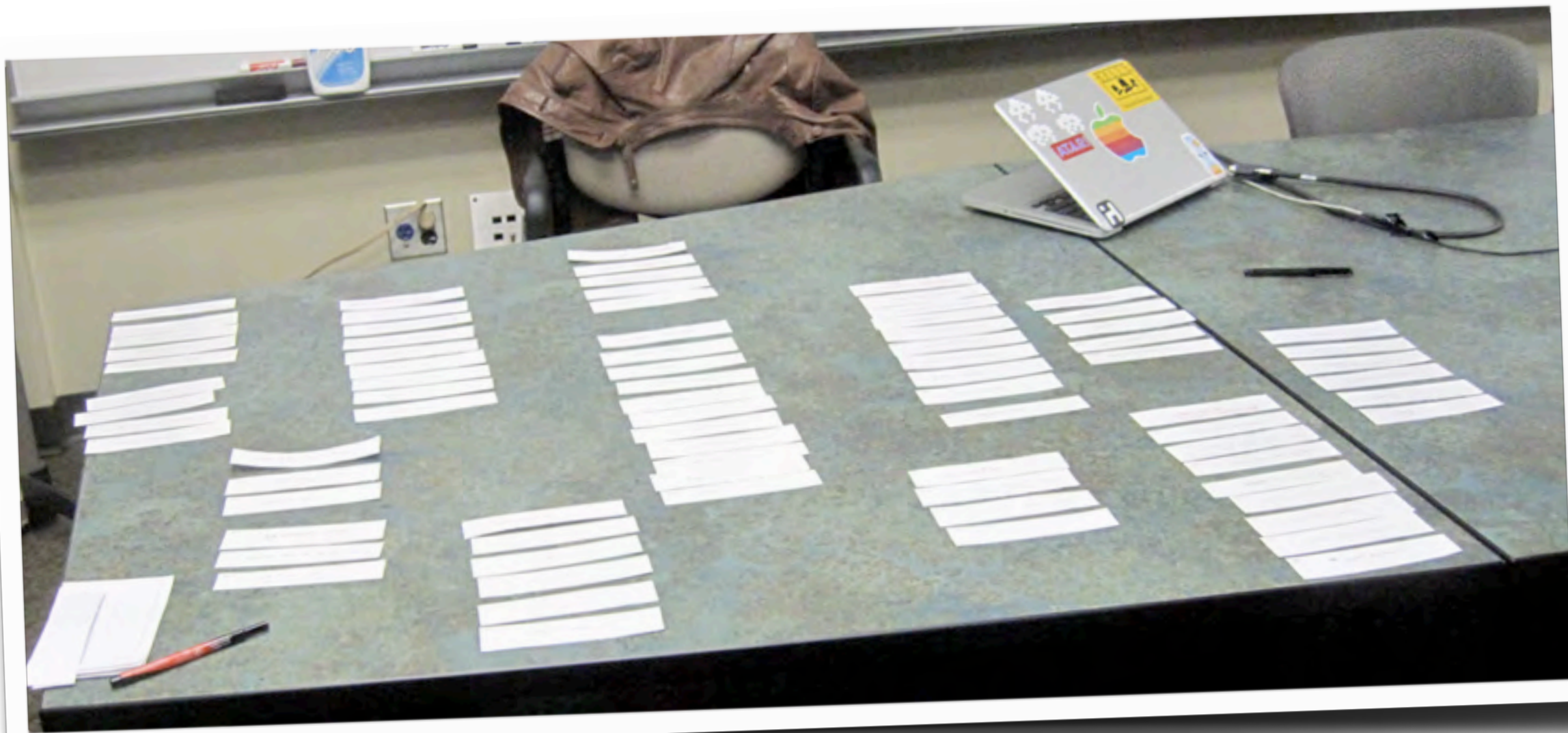




# 10 Frameworks\*

\* actually the most recent version has 14

Broke the frameworks  
into individual elements



# Creativity and Innovation

Creativity (EU)

Creativity and Innovation  
(ISTE)

Creativity (P21)

Creating Mind  
(Gardner)

Critical and Creative  
Thinking (AACU)

Inventive Thinking  
(Metiri)

Creativity (Zhao)

3 big ideas emerged

# 21st Century Learning

## Foundational Knowledge

Content, Information Literacy,  
Cross-disciplinary knowledge

1

2

## Meta Knowledge

Problem Solving / Critical Thinking,  
Communication / Collaboration, Creativity

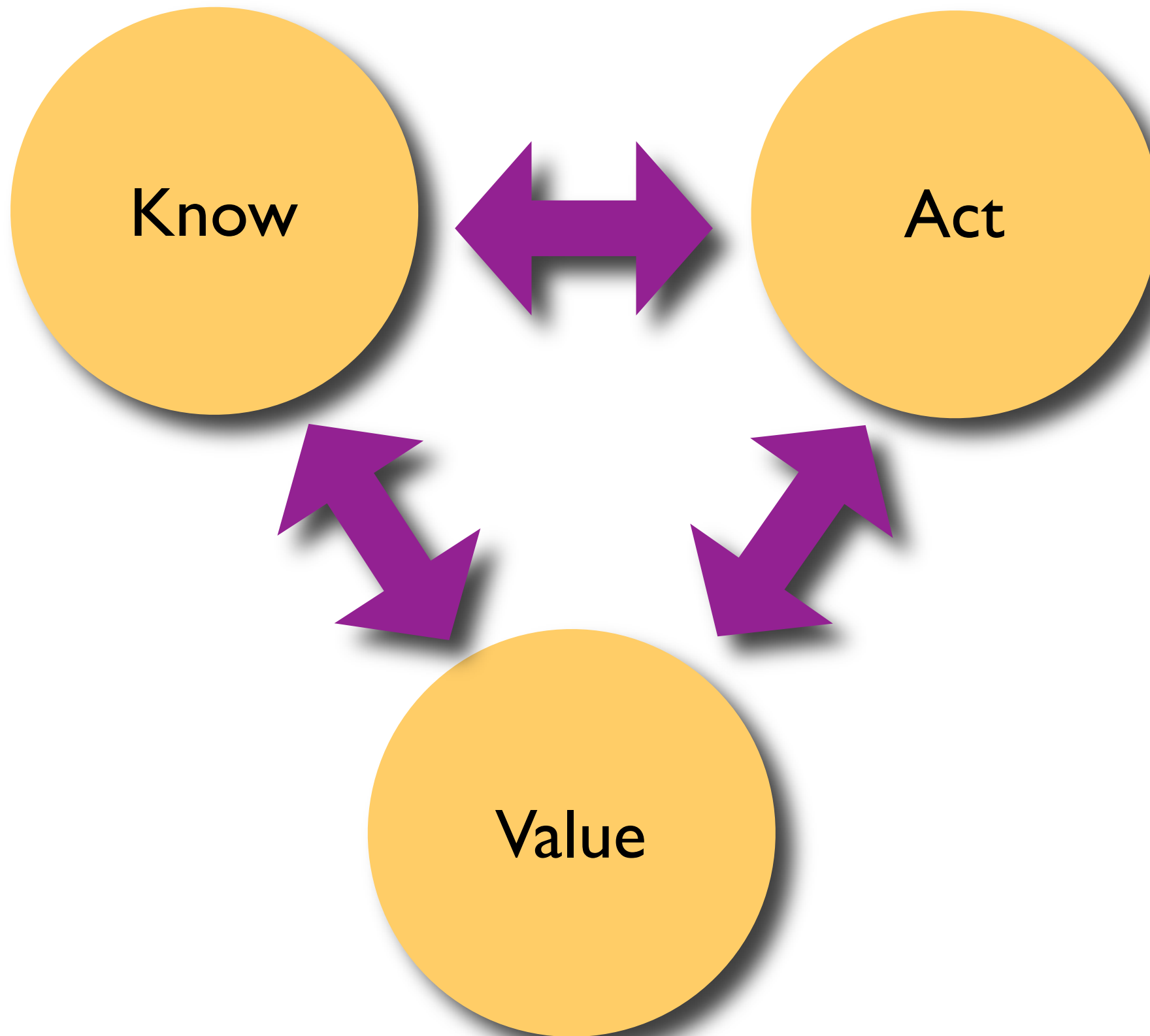
## Humanistic Knowledge

Life/Job skills, Cultural competence,  
Ethical/Emotional Awareness

3


Foundational Knowledge

Meta Knowledge



Humanistic Knowledge

Nothing  
Everything



has changed



How do new technologies  
change us?

They gave her the device when she was only 2 years old. It sent signals along the optic nerve that swiftly transported her brain to an alternate universe—a captivating other world. By the time she was 7 she would smuggle it into school and engage it secretly under her desk... She would sit with it, motionless, oblivious to everything around her, for hours on end. Its addictive grip was so great that she often stayed up half the night, unable to put it down. When she grew up, the device dominated her house: no room was free from it... Neuroscientists demonstrated that large portions of her brain, parts that had once been devoted to understanding the real world, had been co-opted by the device.


What is this device?

Would you give it  
to your children?

Now read **this** passage?

They gave her **books** when she was only 2 years old. **It** sent signals along the optic nerve that swiftly transported her brain to an alternate universe—a captivating other world. By the time she was 7 she would smuggle **books** into school and **read** secretly under her desk... She would sit with **books**, motionless, oblivious to everything around her, for hours on end. **Its** addictive grip was so great that she often stayed up half the night, unable to put **books** down. When she grew up, **books** dominated her house: no room was free from **them**... Neuroscientists demonstrated that large portions of her brain, parts that had once been devoted to understanding the real world, had been co-opted by **books**.

Nothing  
Everything



has changed

# Technology in education





A black and white photograph showing two hands, one from the top and one from the bottom, framing a person's face. The hands are positioned as if holding or supporting the face. The face is in the center, looking directly at the camera. The text "A question of framing" is overlaid in the center of the image.

# A question of framing



# Framing...

... influences what we see, and what we do  
decisions, purchases, teaching objectives,  
teacher education & professional  
development, student learning

A black and white photograph of two hands cupped together, framing the text. The hands are positioned with fingers slightly curled, creating a central space where the text is placed. The lighting is soft, highlighting the texture of the skin and the contours of the hands.

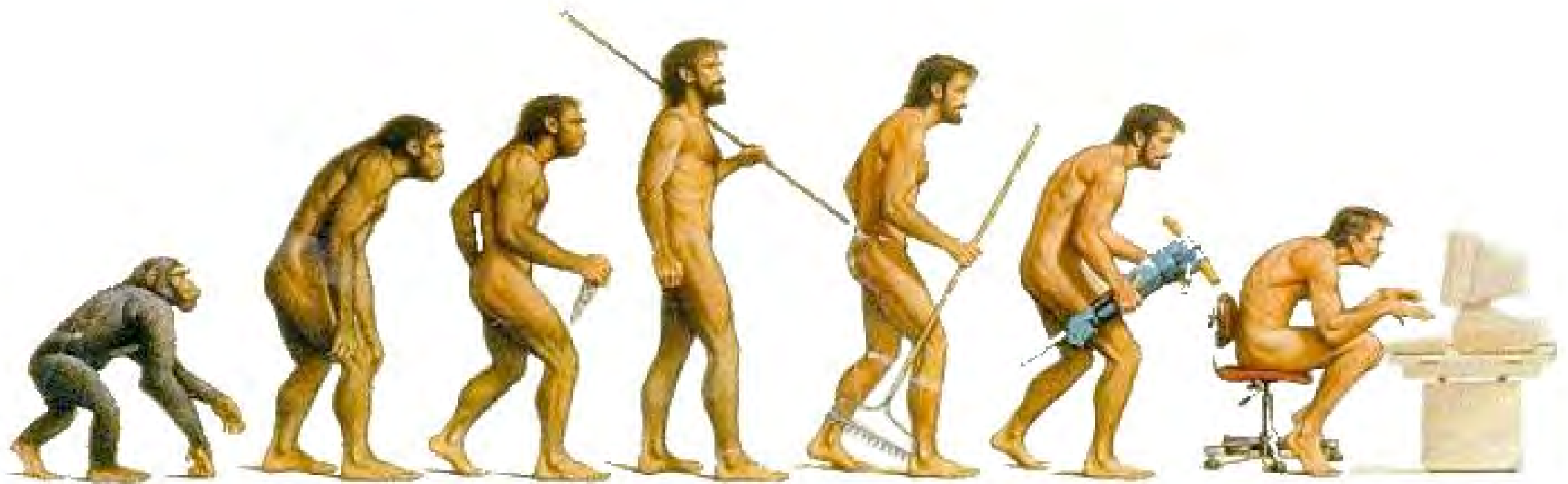
# The Technocentric Frame

# Questioning Techno-centrism (1, 2, 3)

# Questioning Techno-centrism

(1)

Rapid rate  
of change

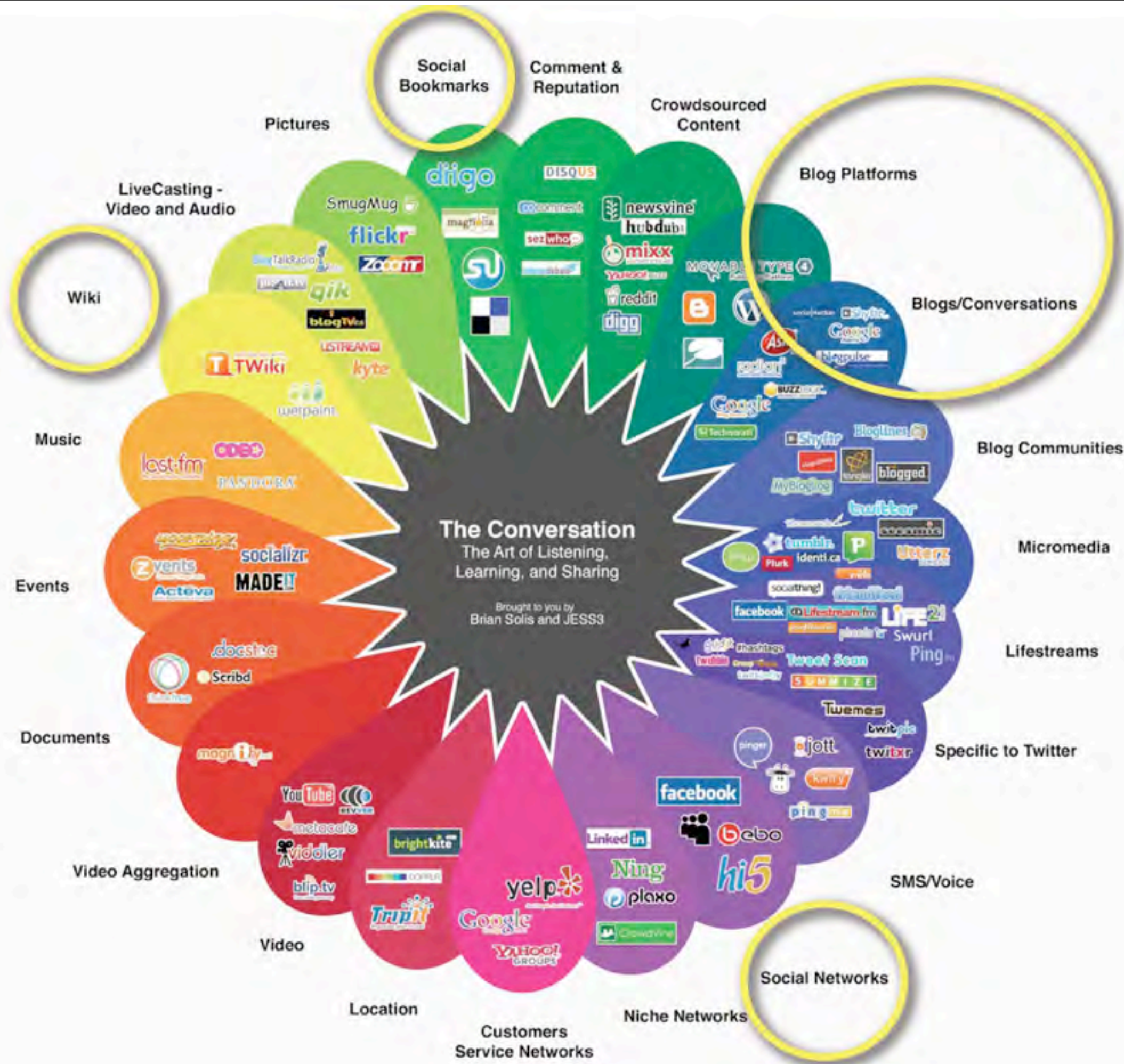




Generations	
10,000	speech
750	agriculture
500	writing
400	libraries
40	universities
24	printing
16	accurate clocks
5	telephone
4	radio
3	television
2	computers
1	internet/email
0	gps, mp3, youtube, web2.0 etc. etc.









From...





... to this!



Can't really keep up!





# Questioning Techno-centrism

## (2)

# Rethinking Technology

What is an educational  
Technology?



What is an educational  
Technology?



There is no such thing











# The problem

Most technologies are  
**NOT** designed for  
education!

But

Users redefine  
technologies

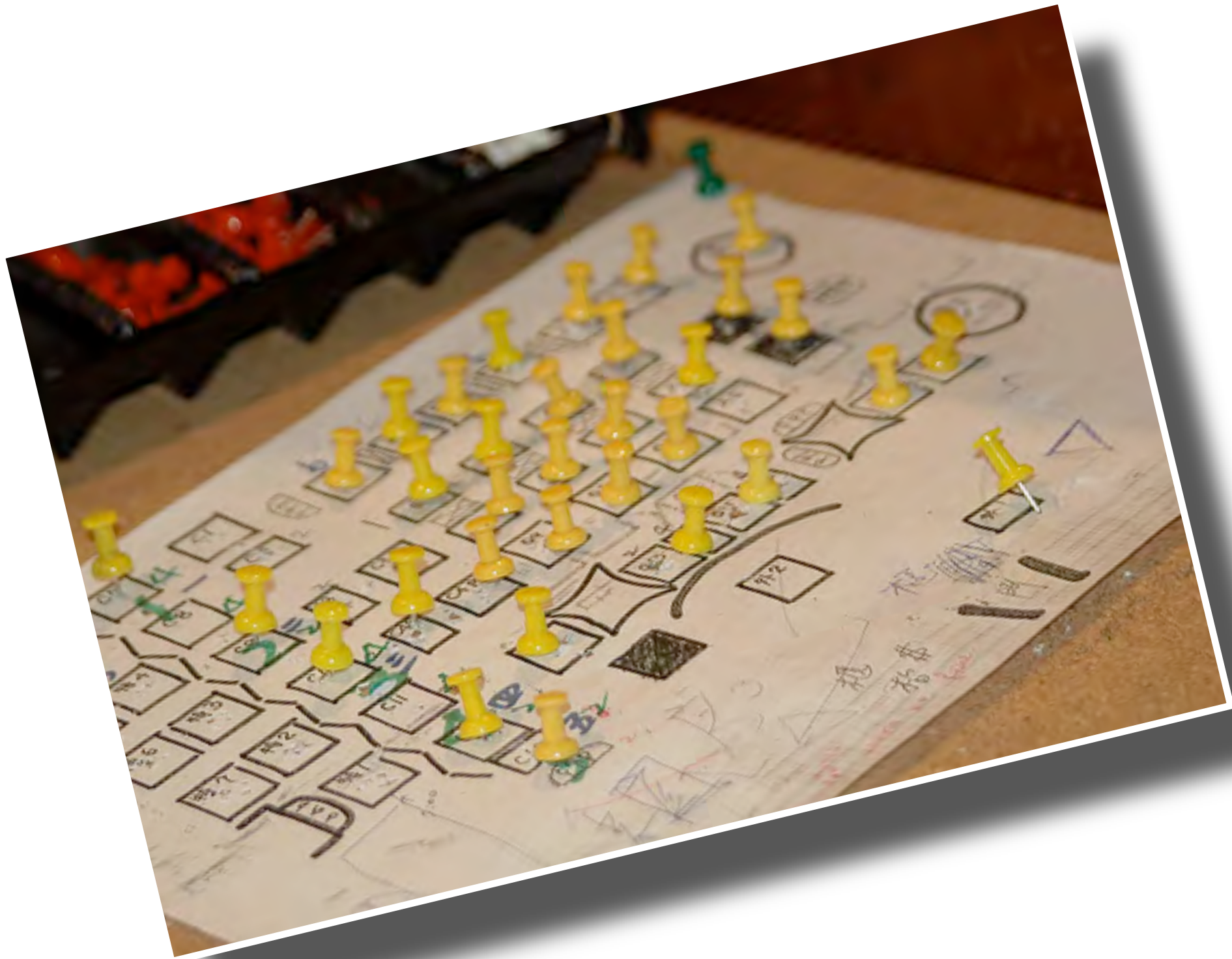














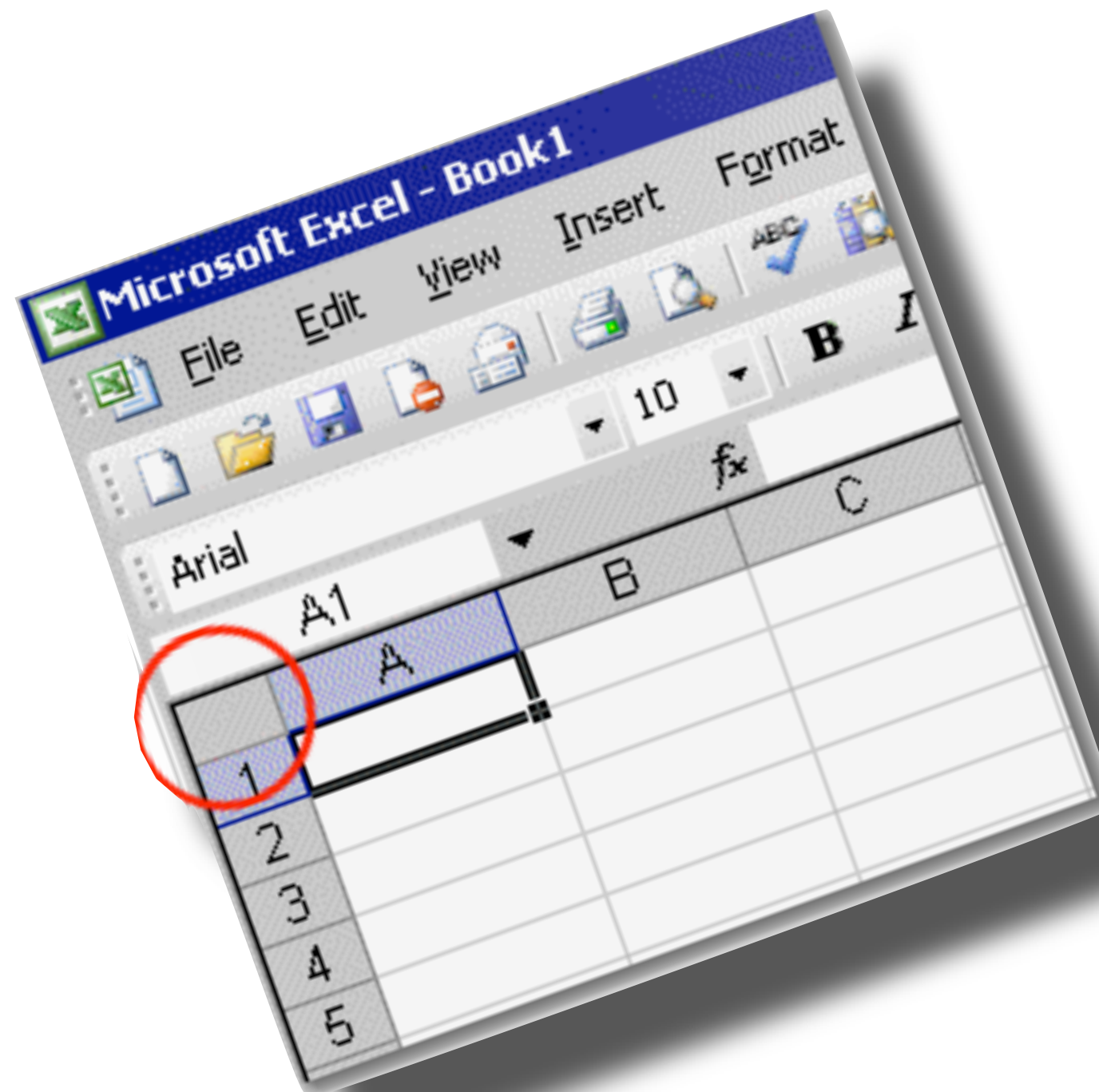


Why is this important?

Only repurposing makes  
a technology  
an educational technology..







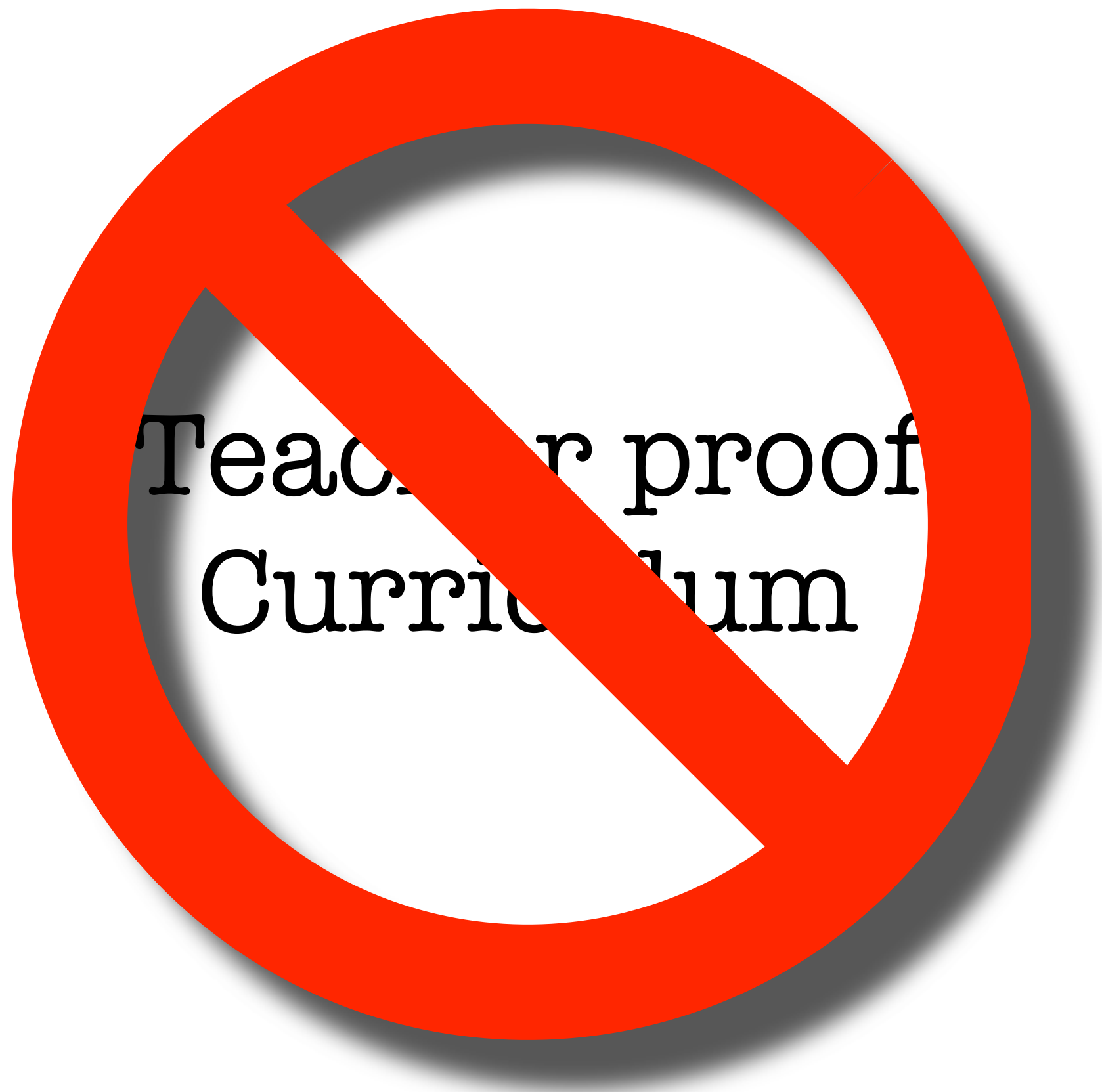


# Textbooks

Repurposing is  
a creative  
& innovative act

The crucial mediating  
role played by the  
teacher...

# Teacher proof Curriculum



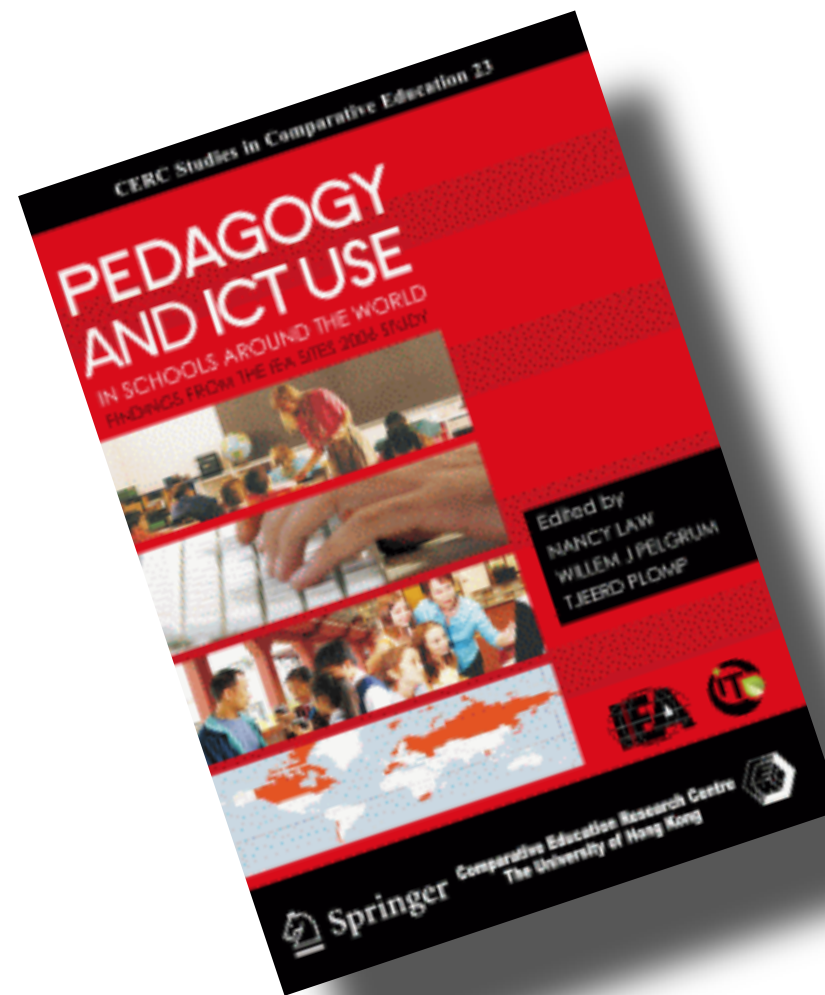
Teacher proof  
Curriculum

Questioning Techno-centrism

(3)

Ignoring  
Content & Pedagogy

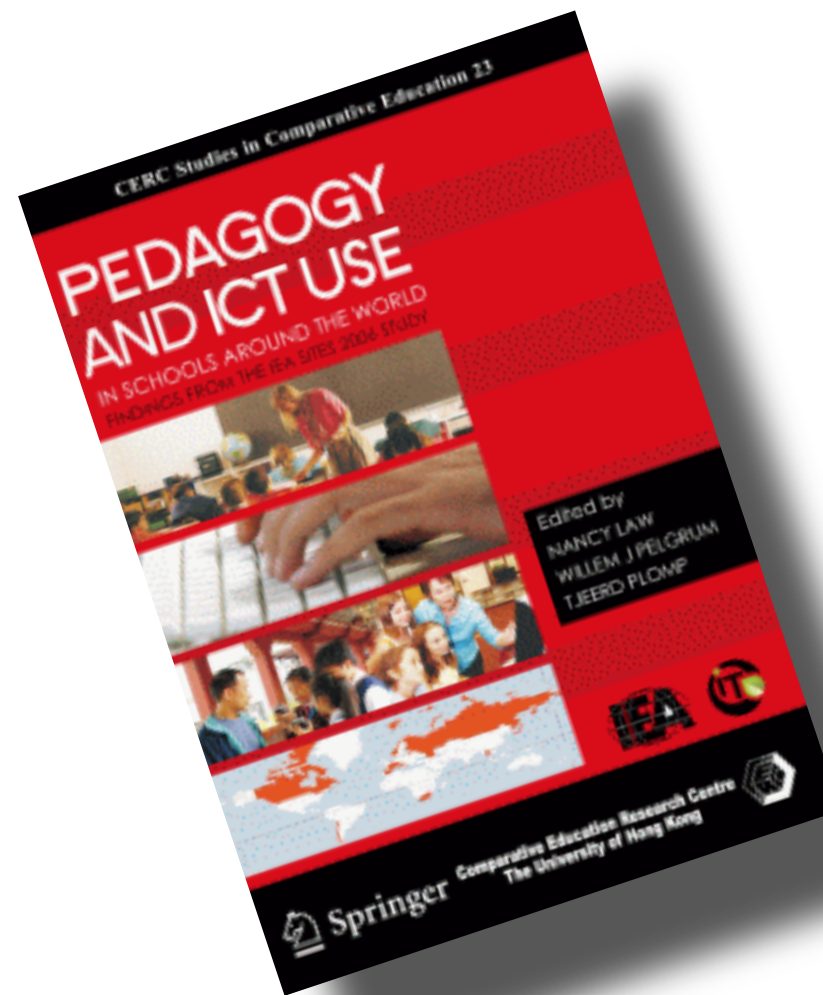




# SITES 2006

## IEA Second Information Technology in Education Study

Law, N., Pelgrum, W.J. & Plomp, T. (eds.) (2008). Pedagogy and ICT use in schools around the world: Findings from the IEA SITES 2006 study. Hong Kong: CERC-Springer.



35,000 teachers  
from 9,000 schools  
across 22 countries

NOT

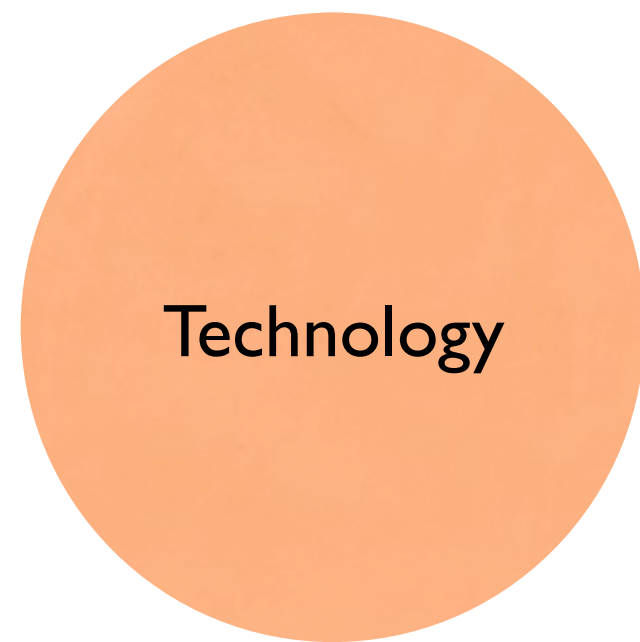
that increased technology use led to student learning

INSTEAD

the effectiveness of technology use depended on the teaching approaches used in **conjunction** with technology

IN OTHER WORDS:

If you are not going to change **pedagogy** then **technology** use makes no significant difference



Technocentrism

Moving beyond



TECHNOLOGY

Technology changes  
how we teach





MIT **OPEN** COURSEWARE  
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

**OPEN** COURSEWARE  
CONSORTIUM



**KHAN**  
ACADEMY

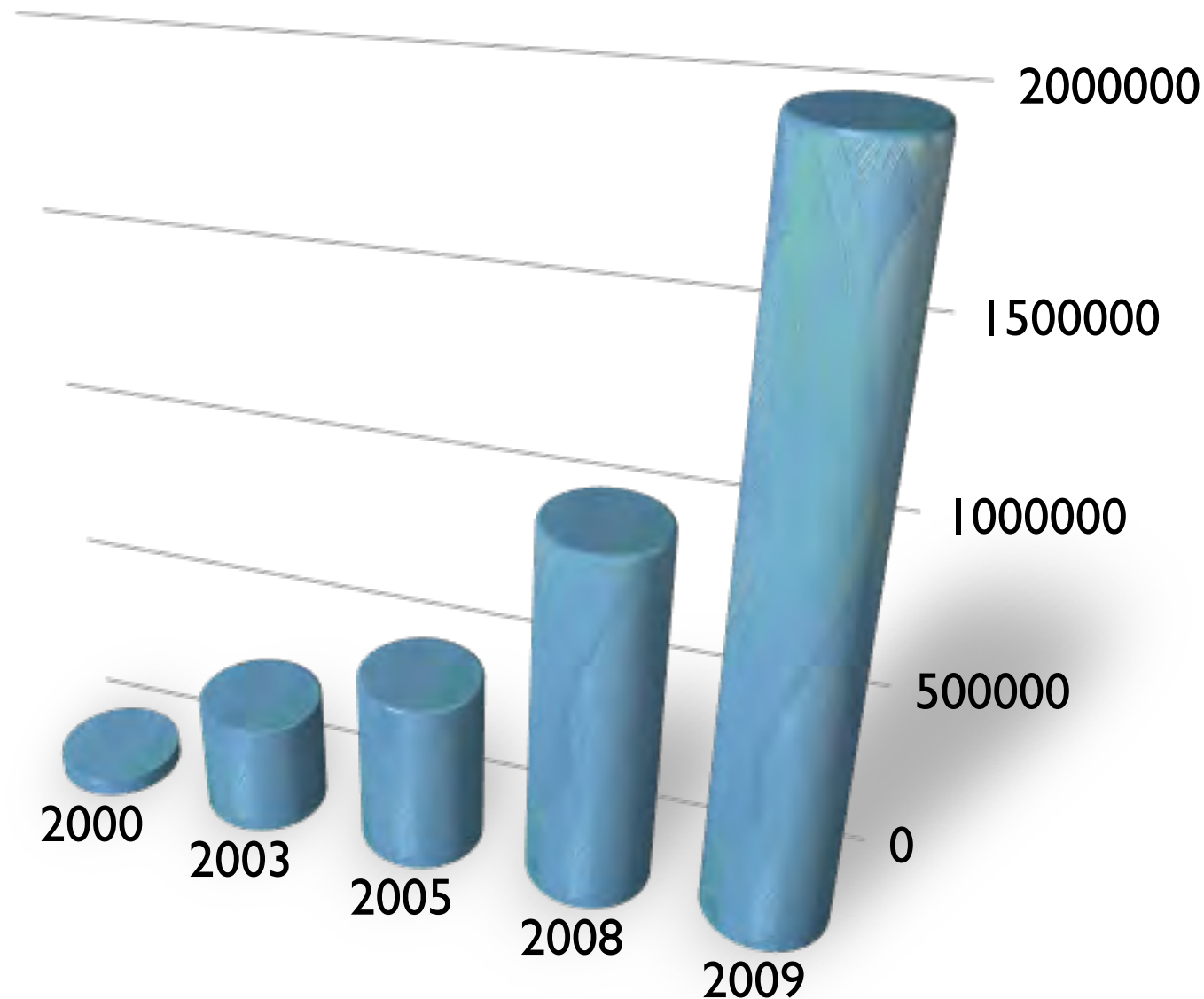
1200+ videos

Everything from arithmetic &  
Algebra to differential equations  
Physics, chemistry, biology & finance  
([www.khanacademy.org](http://www.khanacademy.org))



# K-12 Online learning

(growing 30% annually)



Also higher ed:  
1 in 5 students (approx. 4 million)

1 quick example



A standard question  
Can online be as good as  
face to face?

My response

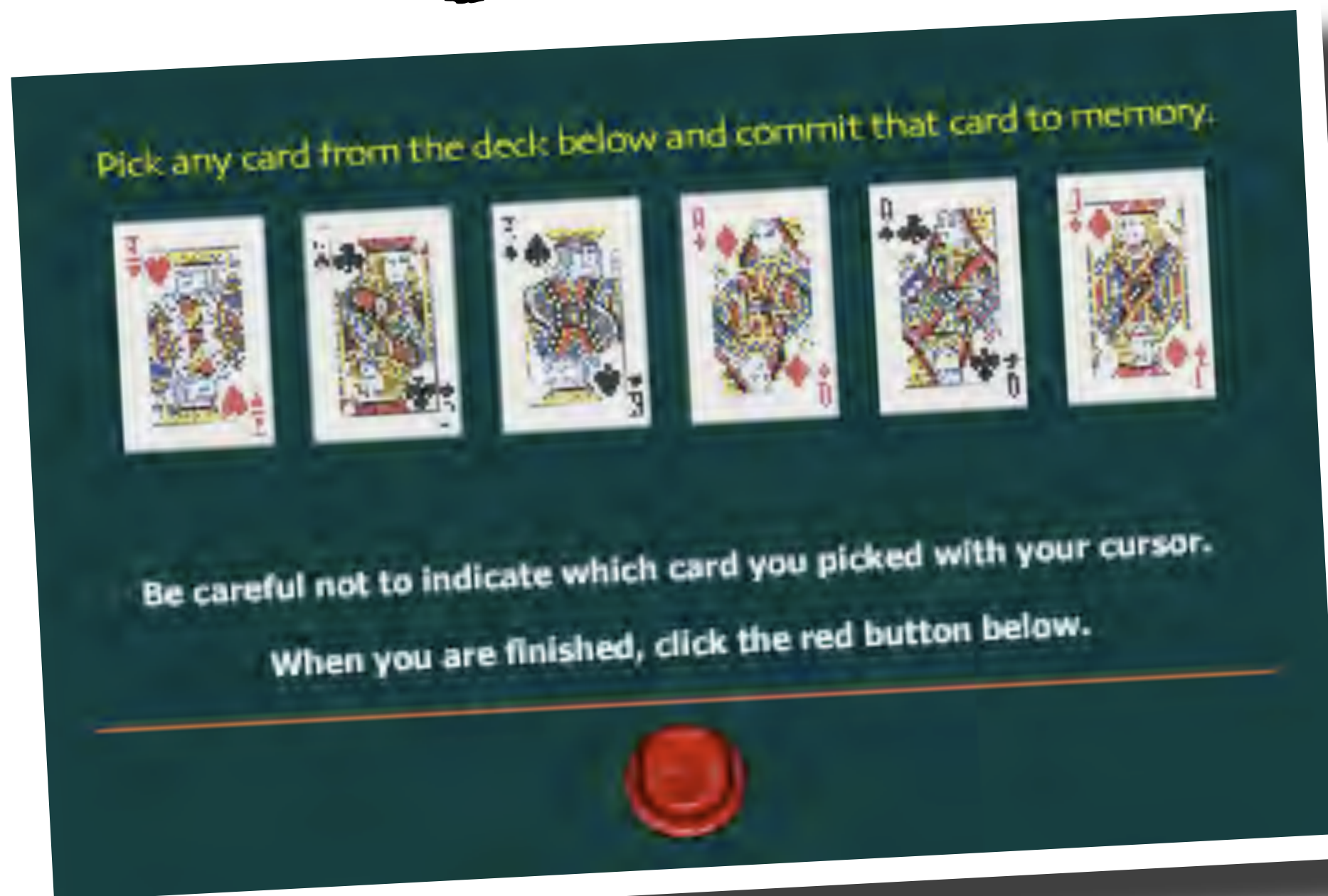
Argghhhhhhh!!



Turn the question  
on its head?

Can face to face be  
as good as online?

# Magic trick



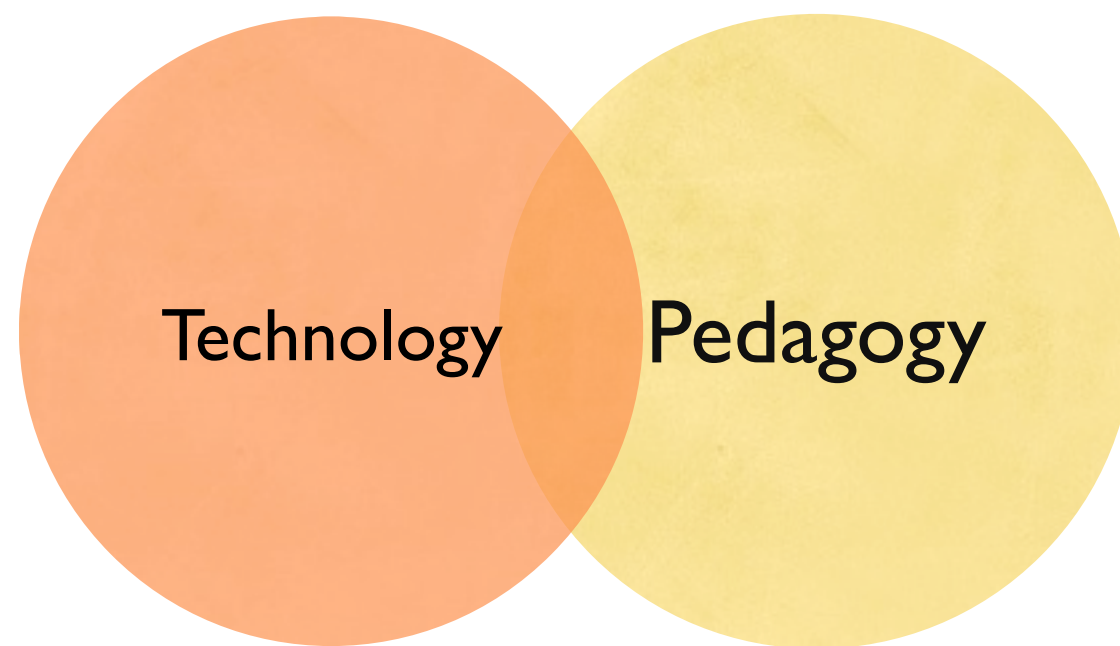
Online discussions  
v.s.  
Face to face!





Me too





But

Burt



Teaching is always  
about something



**Content**

# The goals of education



Disciplines teach  
us to see

---

Purposes | Knowledge | Methods | Forms

Art | Mathematics | Music | Science  
Engineering | History | Physics  
Political science | Education

Disciplines teach  
us to see

---

Purposes | Knowledge | Methods | Forms

However...





Knowing a discipline



# Teaching a discipline

Technology changes  
what we teach

# The transformation of content due to technology

mathematics

science

physics

engineering

history

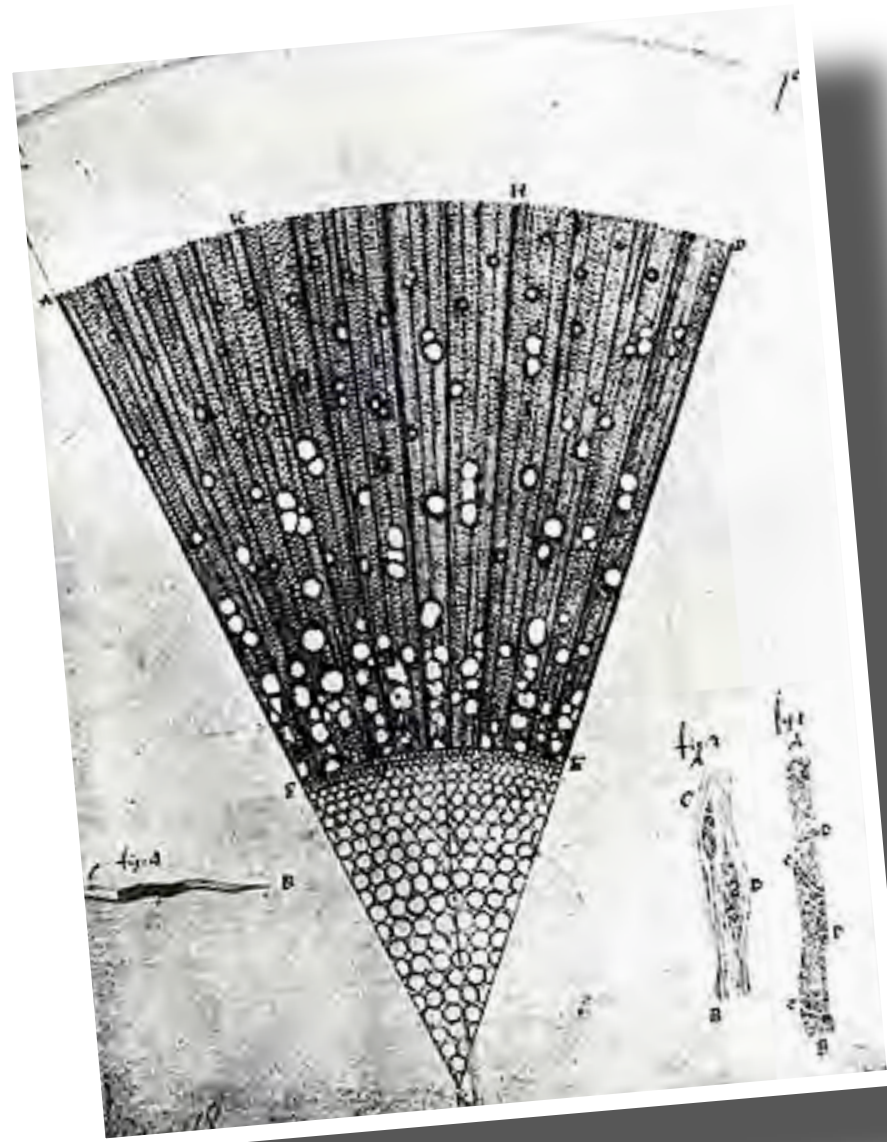
political science

education

.

.

.



# Antonie van Leeuwenhoek

Periodic Table  
of the Elements

1 H																	2 He	
3 Li	4 Be																	10 Ne
11 Na	12 Mg																	18 Ar
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr	
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe	
55 Cs	56 Ba	57 *La	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn	
87 Fr	88 Ra	89 +Ac	104 Rf	105 Ha	106 Sg	107 Ns	108 Hs	109 Mt	110 110	111 111	112 112	113 113						

- \* Lanthanide Series
- + Actinide Series

*s*-Block

H	
Li	Be
Na	Mg
K	Ca
Rb	Sr
Cs	Ba
Fr	Ra

*f*-Block

La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb
Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No

*d*-Block

Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn
Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd
Lu	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg
Lr	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Uub

*p*-Block

B	C	N	O	F	Ne
Al	Si	P	S	Cl	Ar
Ga	Ge	As	Se	Br	Kr
In	Sn	Sb	Te	I	Xe
Tl	Pb	Bi	Po	At	Rn
Uut	Uuq	Uup	Uuh		



# PERIODIC TABLE OF THE ELEMENTS

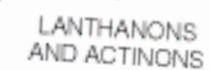
## Table of Radioactive Isotopes

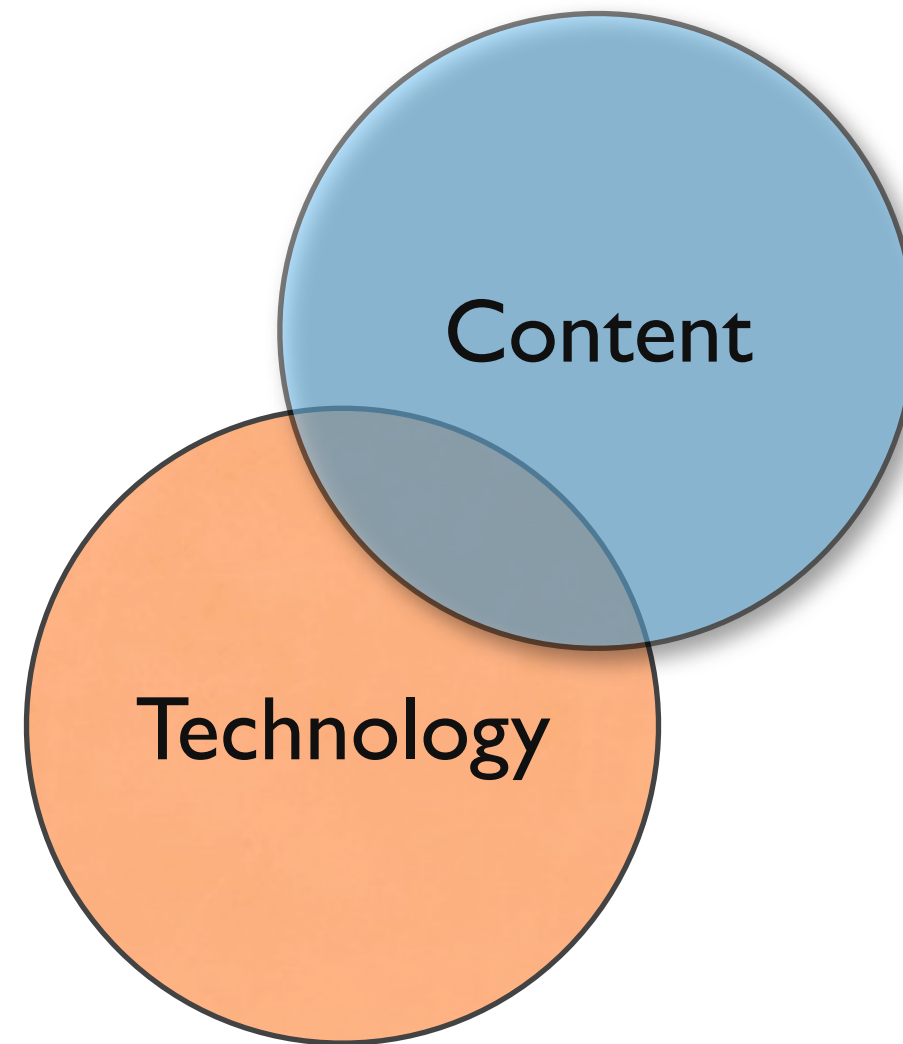
<p><b>GROUP 1A</b></p> <p>1 <b>H</b></p> <p>3 <b>Li</b></p> <p>11 <b>Na</b></p> <p>19 <b>K</b></p> <p>37 <b>Rb</b></p> <p>55 <b>Cs</b></p> <p>87 <b>Fr</b></p>															
<p><b>GROUP 2A</b></p> <p>4 <b>Be</b></p> <p>12 <b>Mg</b></p> <p>20 <b>Ca</b></p> <p>38 <b>Sr</b></p> <p>56 <b>Ba</b></p> <p>88 <b>Ra</b></p>															
<p><b>GROUP 3A</b></p> <p>5 <b>B</b></p> <p>13 <b>Al</b></p> <p>31 <b>Ga</b></p> <p>49 <b>In</b></p> <p>81 <b>Tl</b></p>															
<p><b>GROUP 4A</b></p> <p>6 <b>C</b></p> <p>14 <b>Si</b></p> <p>32 <b>Ge</b></p> <p>50 <b>Sn</b></p> <p>82 <b>Pb</b></p>															
<p><b>GROUP 5A</b></p> <p>7 <b>N</b></p> <p>15 <b>P</b></p> <p>33 <b>As</b></p> <p>51 <b>Sb</b></p> <p>83 <b>Bi</b></p>															
<p><b>GROUP 6A</b></p> <p>8 <b>O</b></p> <p>16 <b>S</b></p> <p>34 <b>Se</b></p> <p>52 <b>Te</b></p> <p>84 <b>Po</b></p>															
<p><b>GROUP 7A</b></p> <p>9 <b>F</b></p> <p>17 <b>Cl</b></p> <p>35 <b>Br</b></p> <p>53 <b>I</b></p> <p>85 <b>At</b></p>															
<p><b>GROUP 8A</b></p> <p>10 <b>Ne</b></p> <p>18 <b>Ar</b></p> <p>36 <b>Kr</b></p> <p>54 <b>Xe</b></p> <p>86 <b>Rn</b></p>															
<p><b>GROUP 9A</b></p> <p>1 <b>He</b></p>															



NOTE: 1. Alpha decay is indicated by a circle with a dot. 2. Beta decay is indicated by a square with a dot. 3. Gamma decay is indicated by a triangle with a dot. 4. The half-life of each isotope is given in minutes, hours, days, years, or billions of years. 5. The final product of the decay chain is Lead-206.

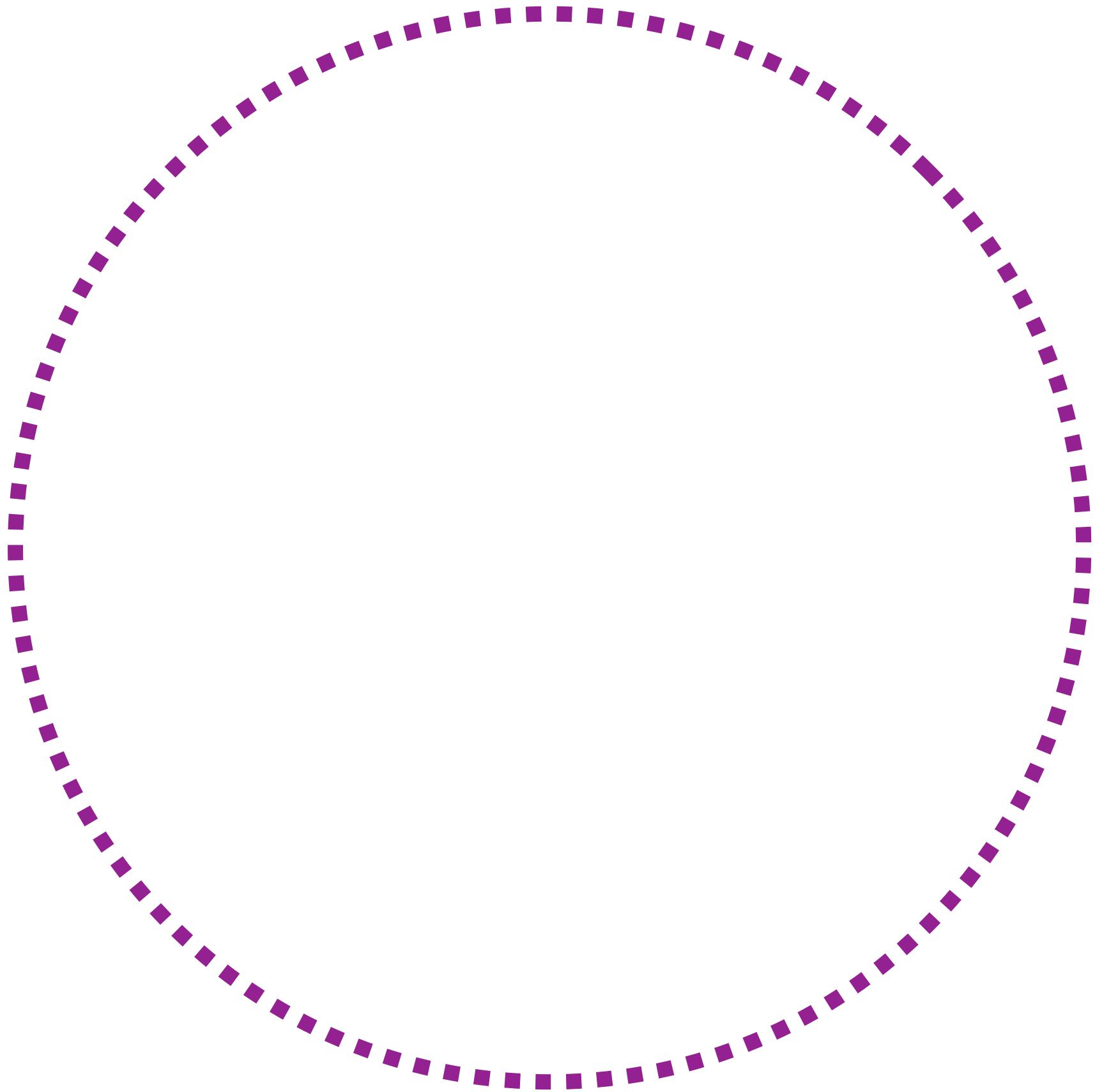
TEXAS PRODUCT  
MILITARY SUPPLY  
FERNANDO J. LUNA  
SILVERDALE



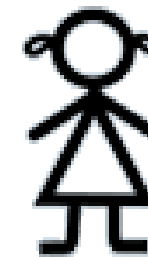


Where does all this  
happen?





Context

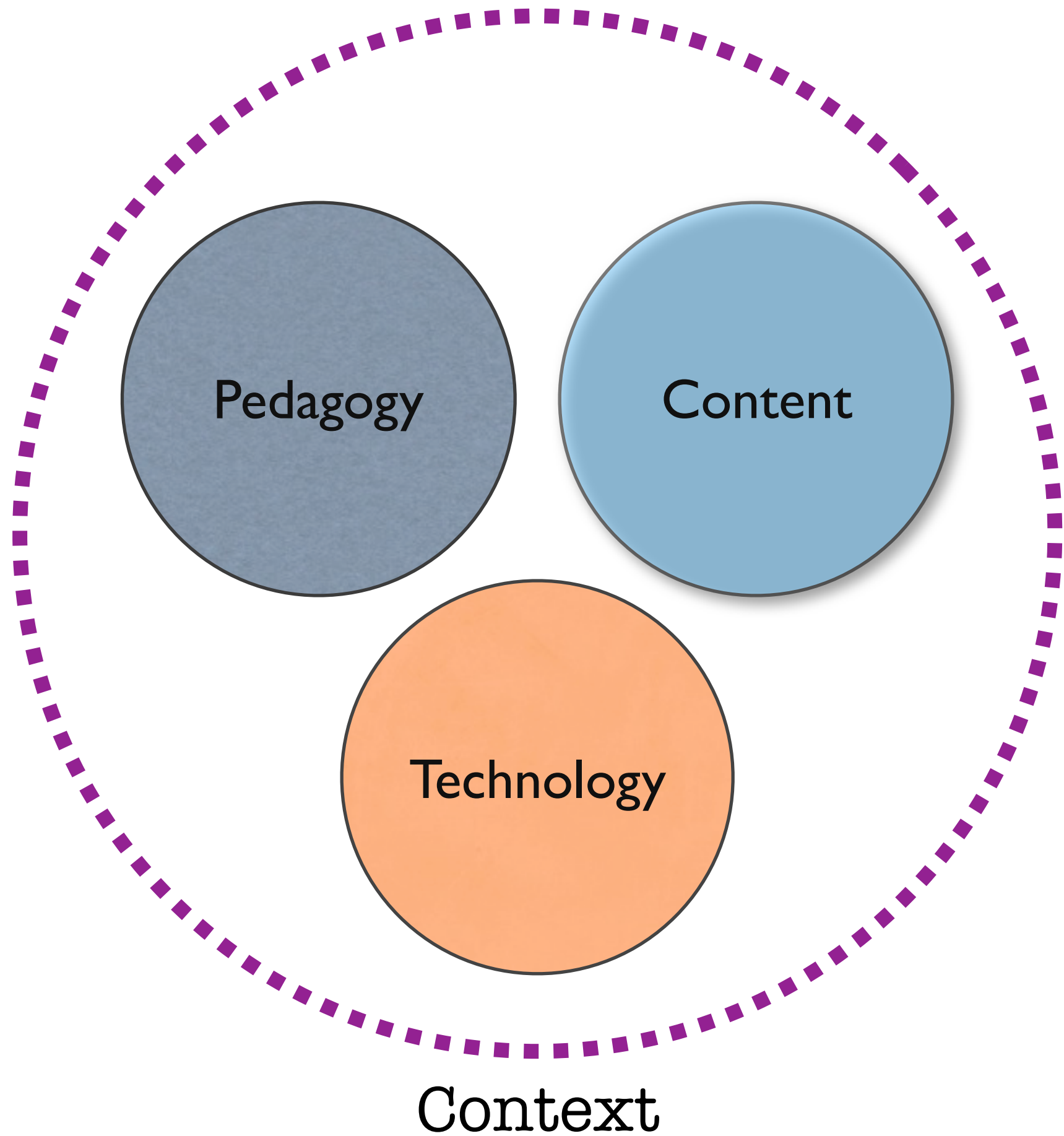




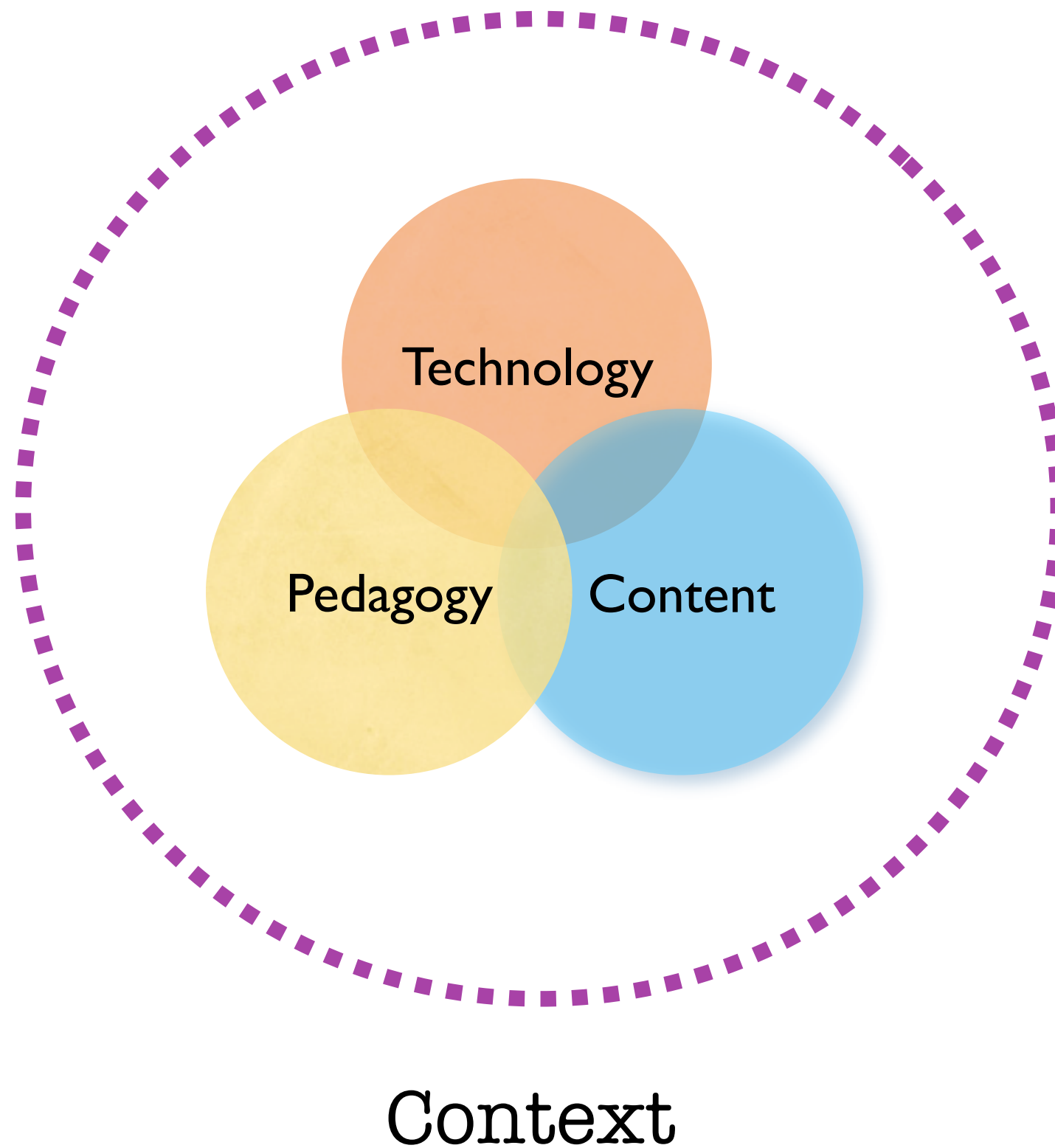




So?

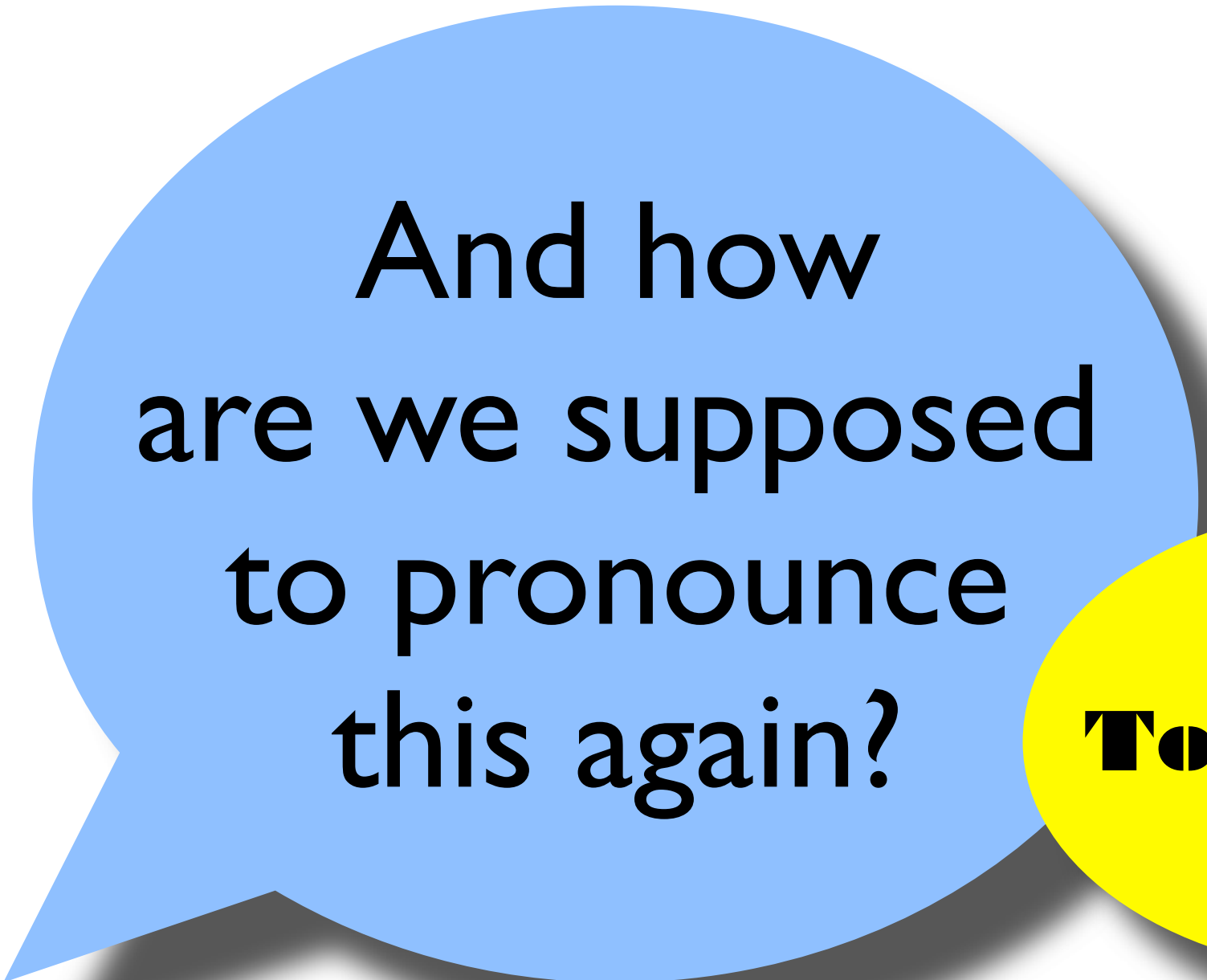


The most  
important  
overlap



# TPCK

Technological Pedagogical  
Content Knowledge



And how  
are we supposed  
to pronounce  
this again?



**ToothPiCK?**



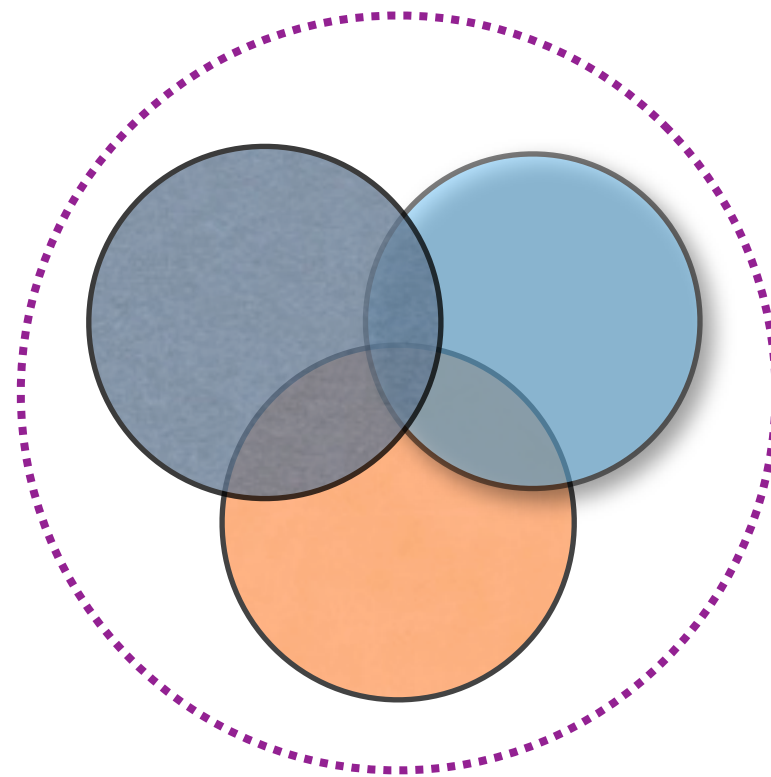
# TPACK

Technological Pedagogical AND  
Content Knowledge

TPCK

TPACK

Total PACKAGE



Total PACKage

# Whether



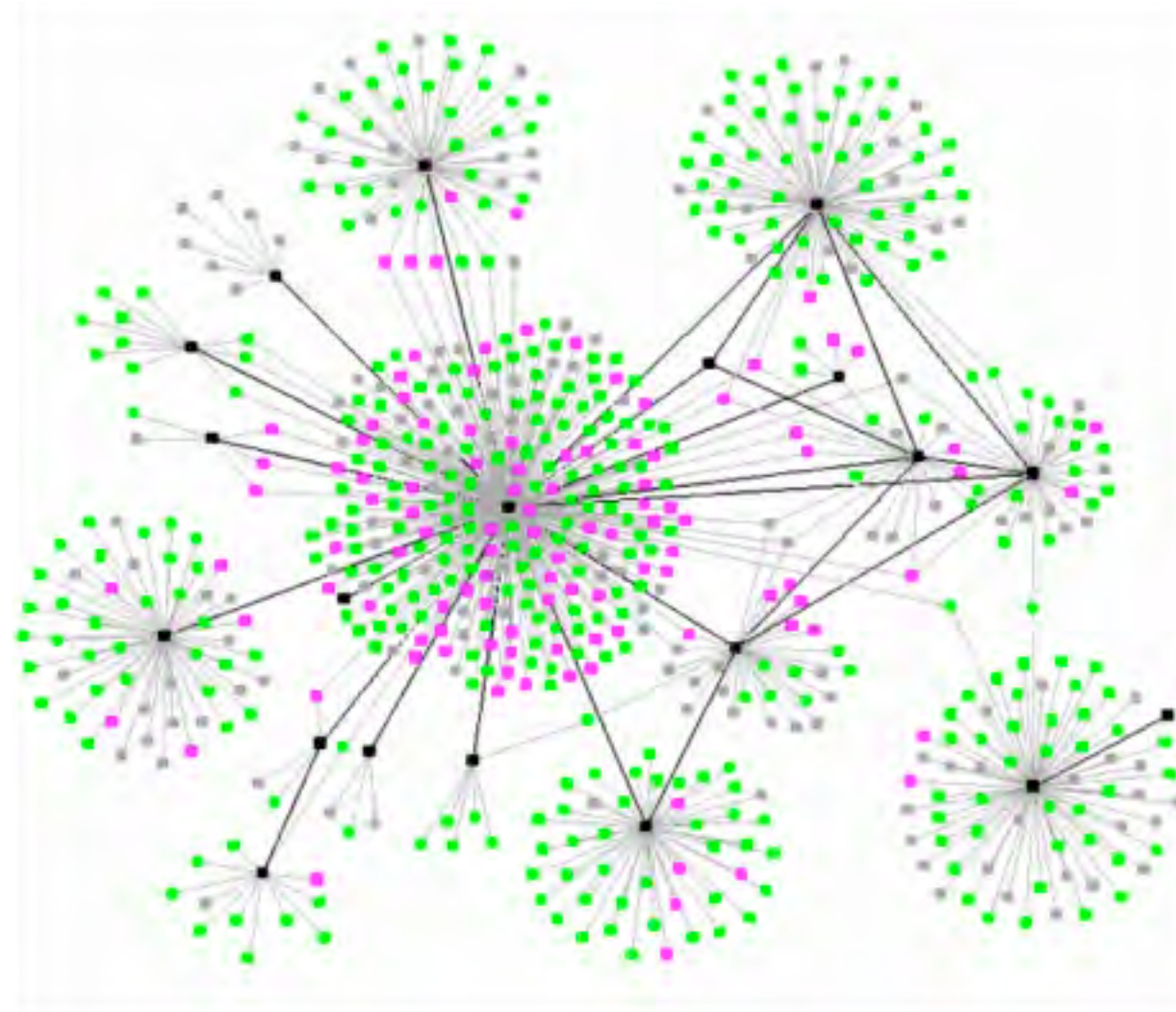
or



or



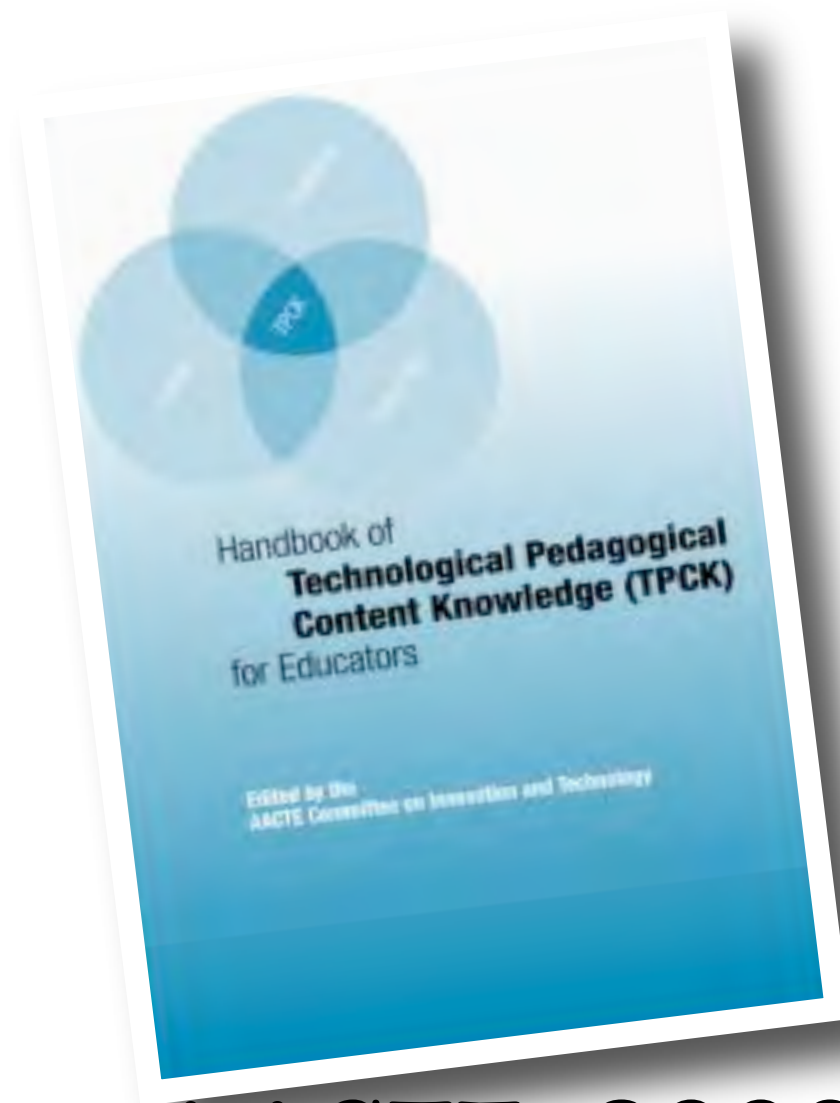
... teaching is always about  
TPACK



# Spreading the word

Key article written in 2006  
(Mishra & Koehler, in TCRecord)\*

\* See [TPACK.org](http://TPACK.org) for precursors  
and history of the idea



AACTE, 2008





The Society for Information Technology in Teacher Education (**SITE**), The American Association of Colleges of Teacher Education (**AACTE**), The National Associations of Childhood Teacher Educators (**NACTE**), National Council for the Social Studies (**NCSS**), Association for Mathematics Teacher Educators (**AMTE**), The Association of Teacher Educators (**ATE**), and the International Society for Technology in Education (**ISTE**) and **many more...**



Over 60+ research articles + textbooks

Over 15 Dissertations

Unified San Diego School District uses TPACK  
as one of its 3 pillars for professional  
development

New York State uses TPACK as a key  
framework for evaluating Race To the Top  
proposals

more...

# 21ST CENTURY KNOWLEDGE AND SKILLS IN EDUCATOR PREPARATION

September 2010



**AACTE**

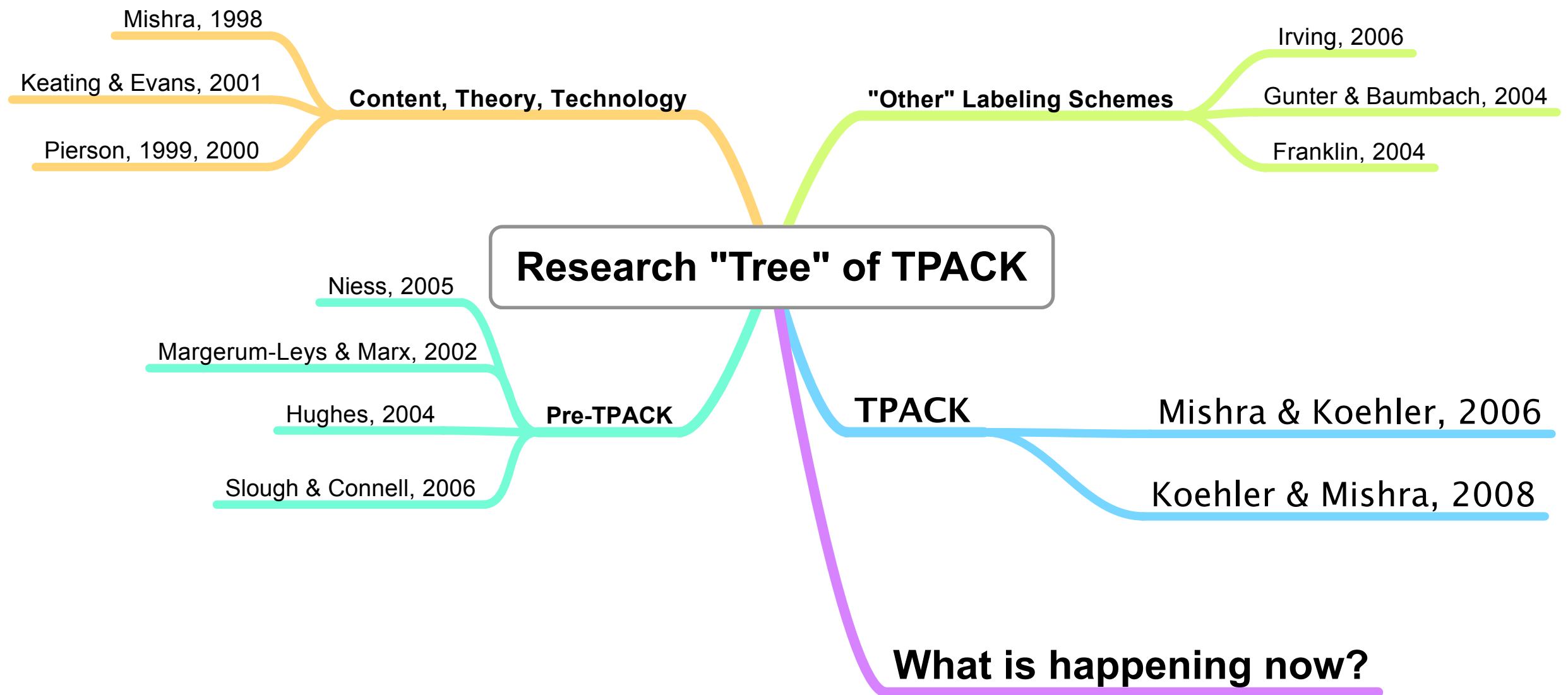
This paper has been produced as part of a collaborative project by the American Association of Colleges of Teacher Education and the Partnership for 21st Century Skills (P21).

Funding for the project was generously provided by Blackboard, ETS, Intel, National Education Association, Microsoft and Pearson.

# www.tpack.org



- + SIG @ SITE
- + TPACK Newsletter
- + Google Group
- + TPACK store :-)
- + more...



- See TPACK wiki – [tpck.org](http://tpck.org)



# Assessing Teachers' Understanding of TPACK...

- **Authentic Design Projects**  
(Koehler, Mishra, & Yahya, 2007)
- **Surveys – Self Assessment**  
(Archambault & Crippen, 2009; Schmidt, Baran, Thompson, Koehler, Mishra, & Shin, 2009-10)
- **Professional Development**  
(Doering, Veletsianos, Scharber, & Miller, 2009)
- **Curriculum Design/Integration – Activity Types**  
(Harris & Hofer, 2009)

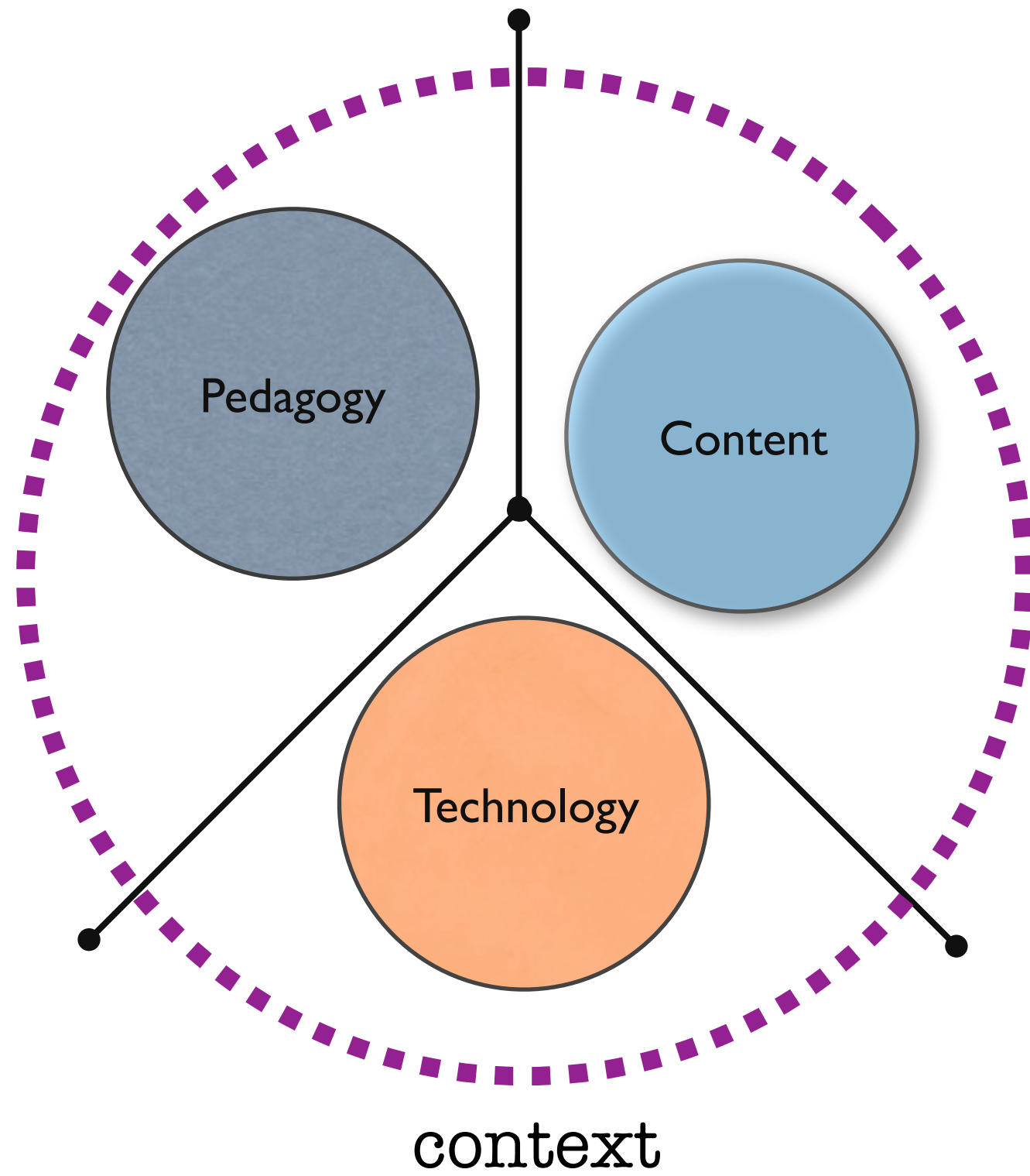
- See TPACK wiki – [tpck.org](http://tpck.org)

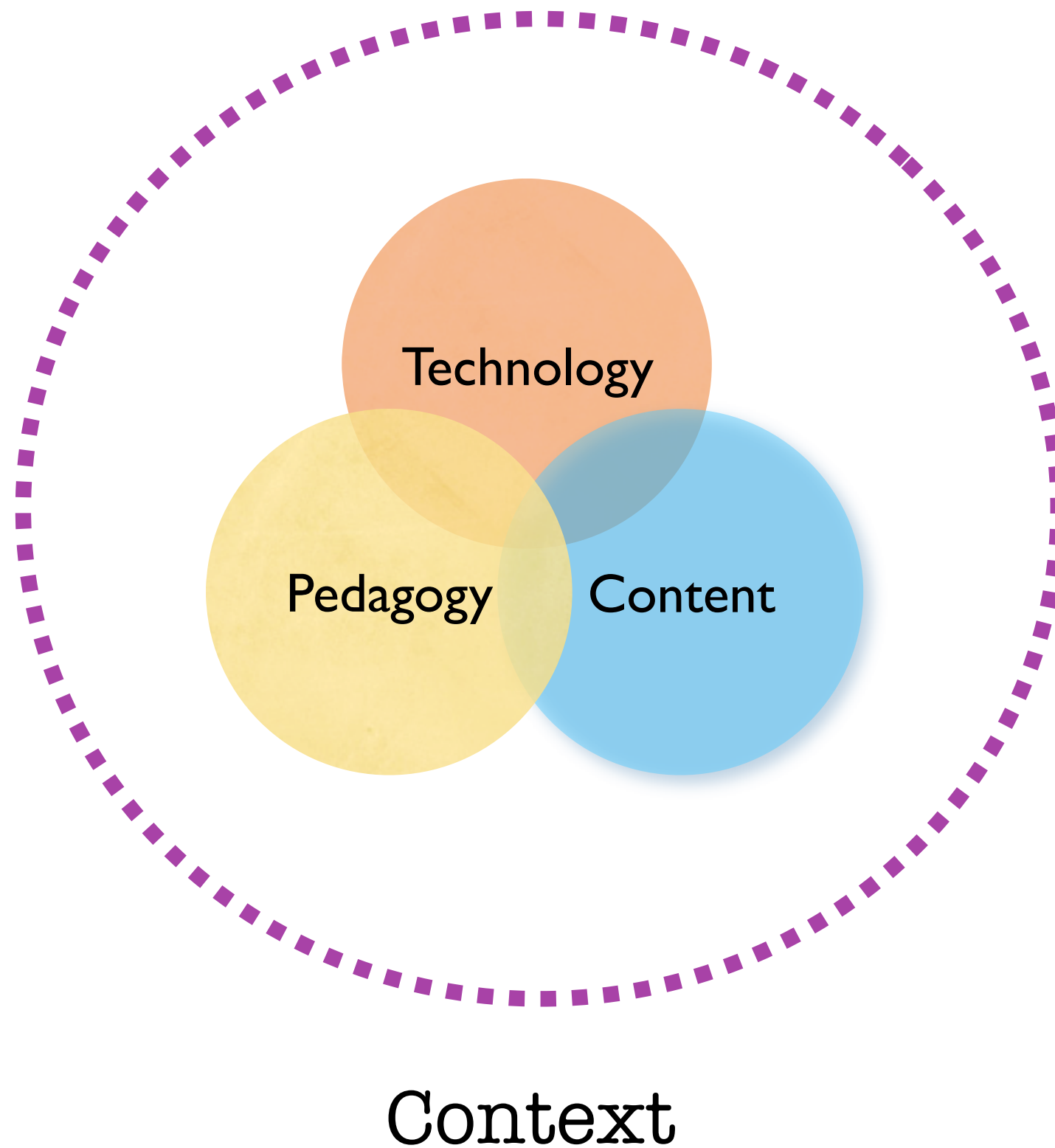






What doesn't work







# Master

## Technology, Pedagogy & Content

# Break out of the box



# The transformative aspects of technology

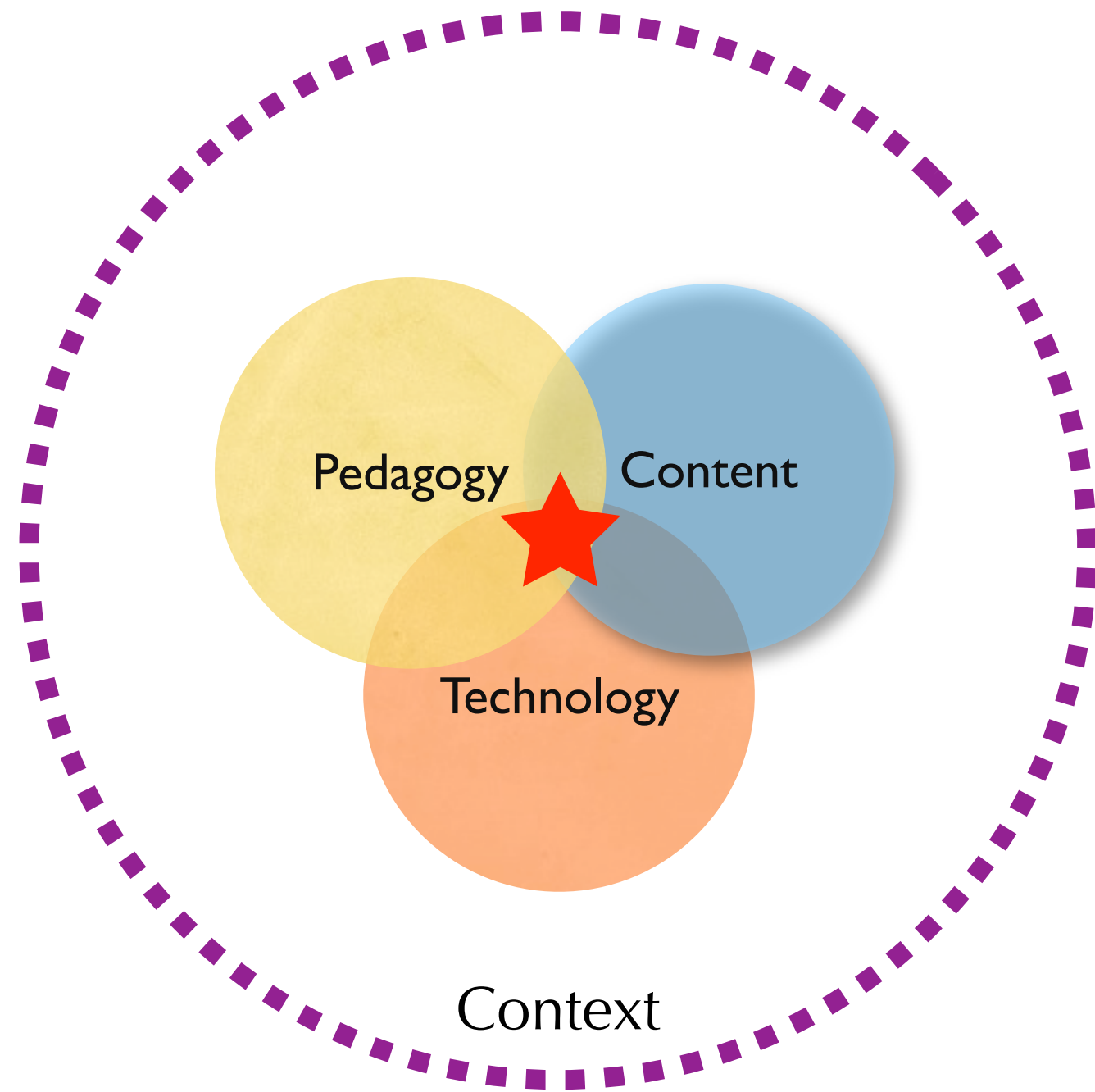


Technology  
Use

Technology  
Integrate

Technology  
Innovate

Develop programs  
that emphasize

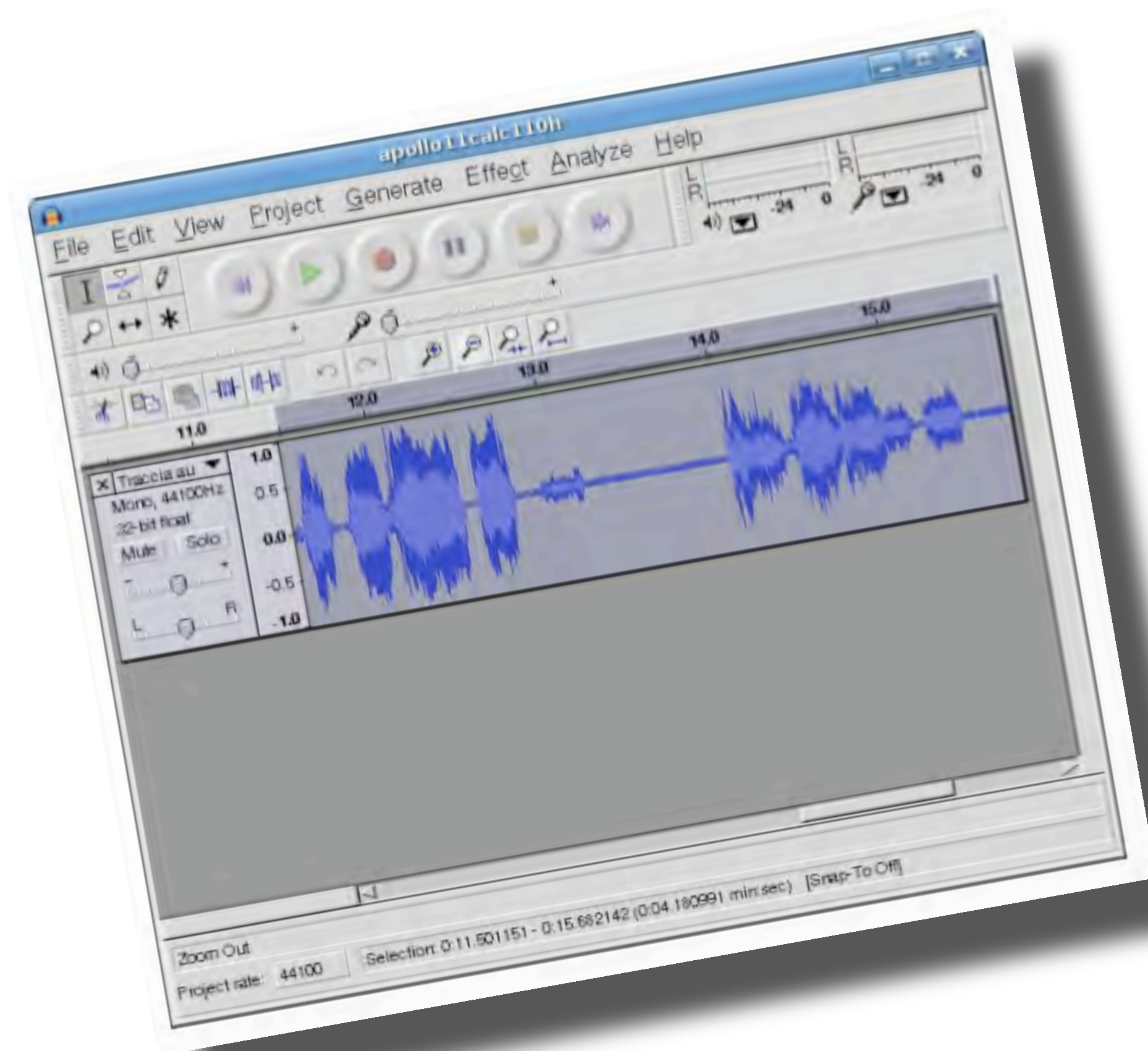


Some examples!

# Distance to moon

Girlanda, L. (2009). Echoes from the moon.  
arXiv:0903.3367v1 [physics.ed-ph]. Retrieved April 1, 2008,  
from <http://arxiv.org/abs/0903.3367v1>







since the tape was recorded at Houston. From the minimum delay in Armstrong's replies (last column of the 2nd row) an upper bound for the Earth-Moon distance was found,  $d_{EM} < (4.5 \pm 0.7) \cdot 10^8$  m.

Replies from	Time delays (s)					
Houston	$1.55 \pm 0.15$	$0.35 \pm 0.15$		$1.35 \pm 0.25$	$1.7 \pm 0.2$	$0.85 \pm 0.15$
Armstrong			$4.05 \pm 0.25$			$3.0 \pm 0.2$

TABLE I: Time delays of the replies in the 3-minutes conversation between Houston and Armstrong during which the famous sentence "one small step for man, one giant leap for Mankind" can be heard. The errors represent the ranges of values measured by the 10 groups of students with

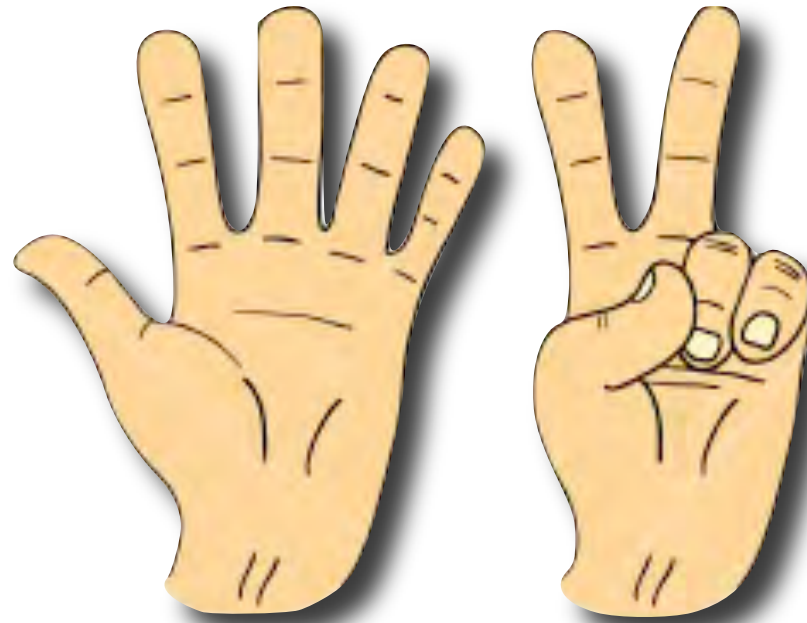






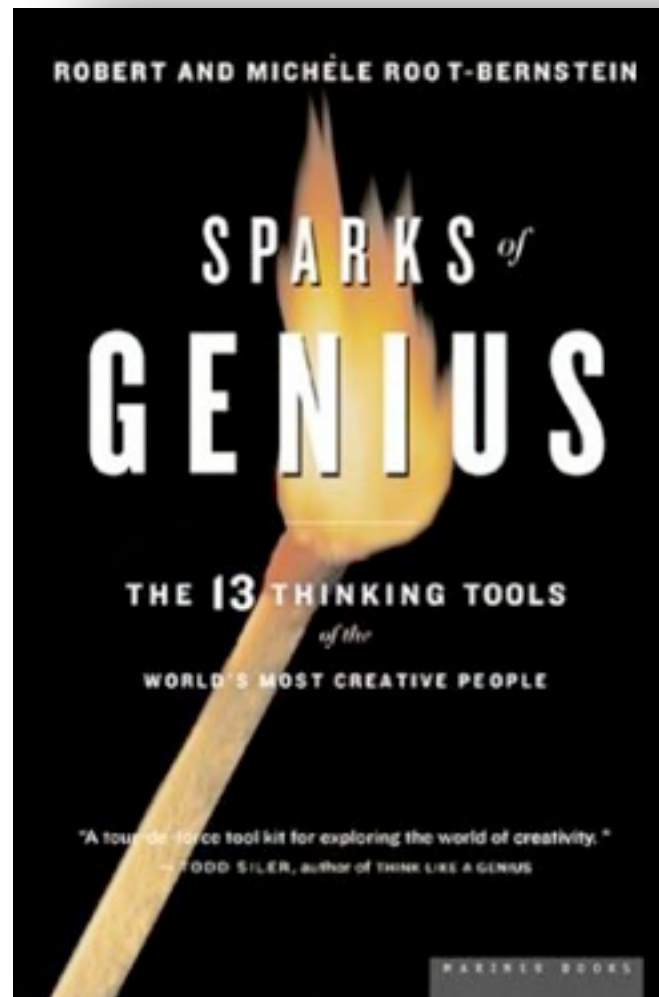
# Searching for Intertextuality

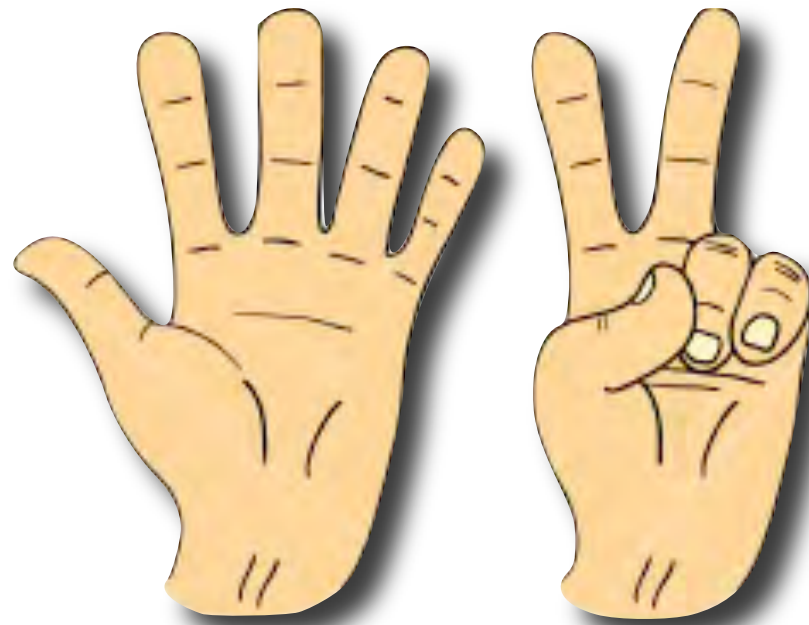
# Creativity



7 trans-disciplinary  
habits of mind  
(for the 21st Century)

# Based on...



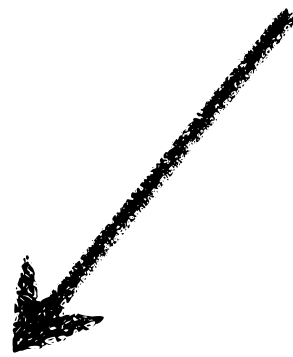


# 7 trans-disciplinary habits of mind (for the 21st Century)

Perceiving | Patterning | Abstracting  
Embodied Thinking | Modeling | Playing | Synthesizing



# 1. Perceiving = Observing & Imaging

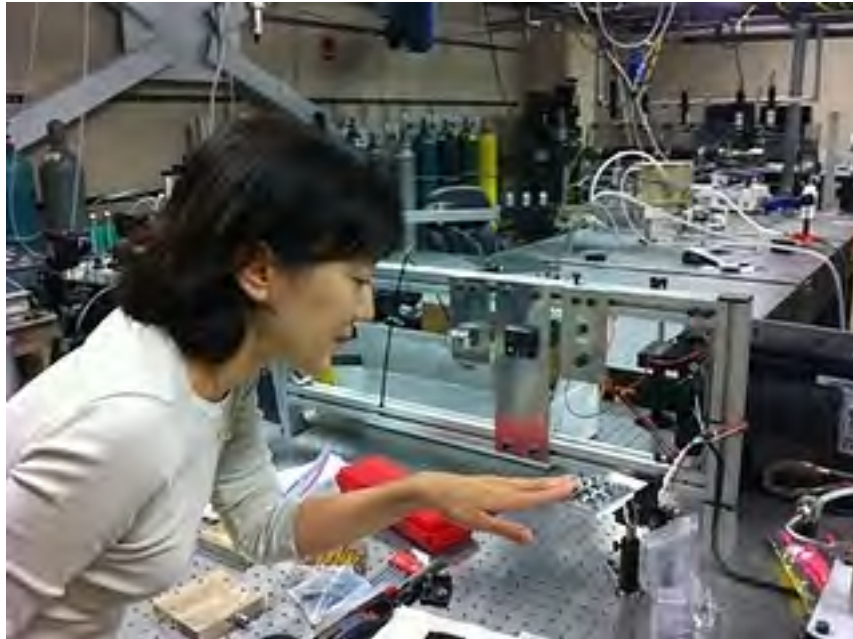


Intent to focus on,  
attend to, and curiosity  
about information

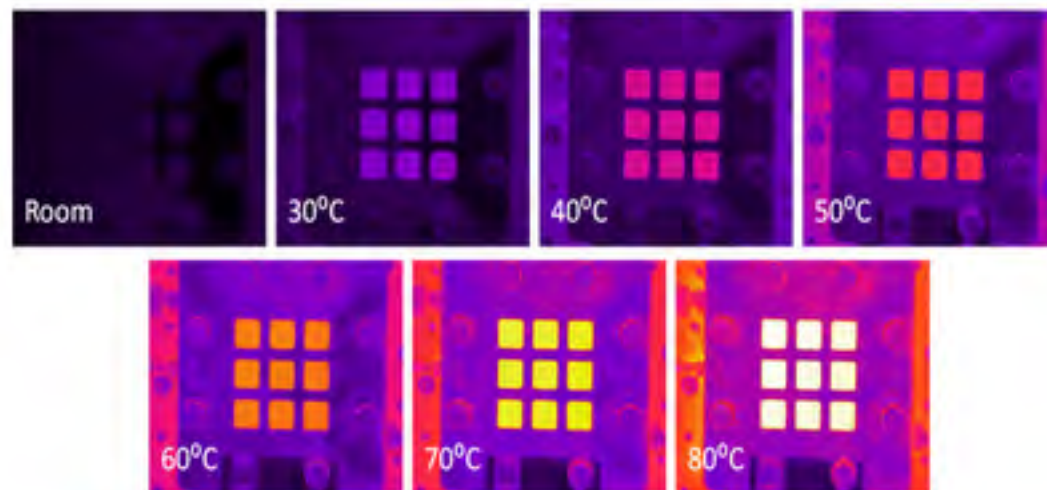


Ability to bring to mind  
observed impressions/  
sensations

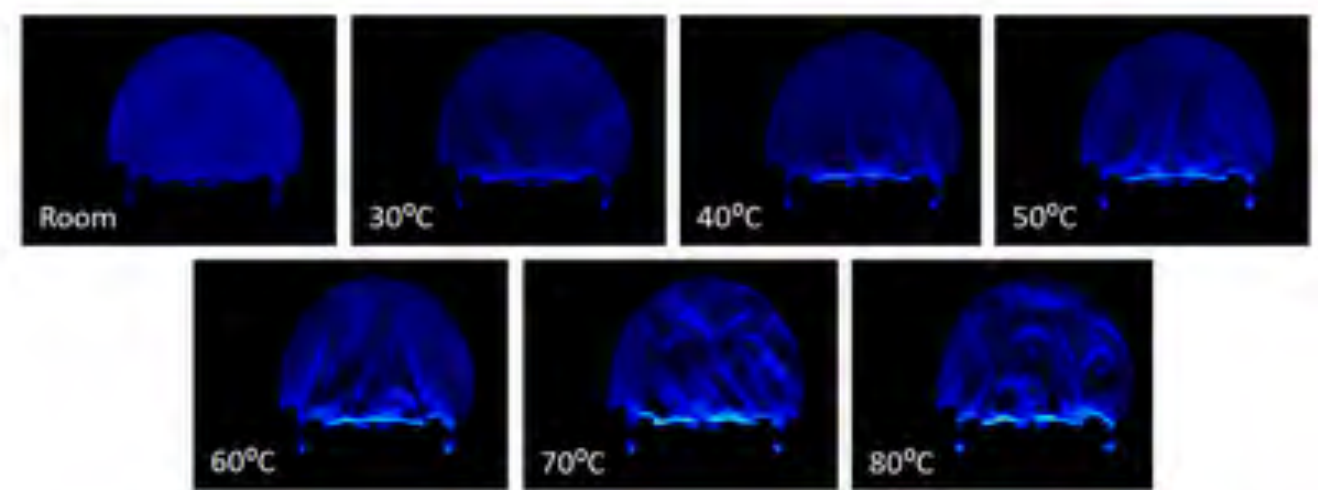
# Perceiving



Heating plate

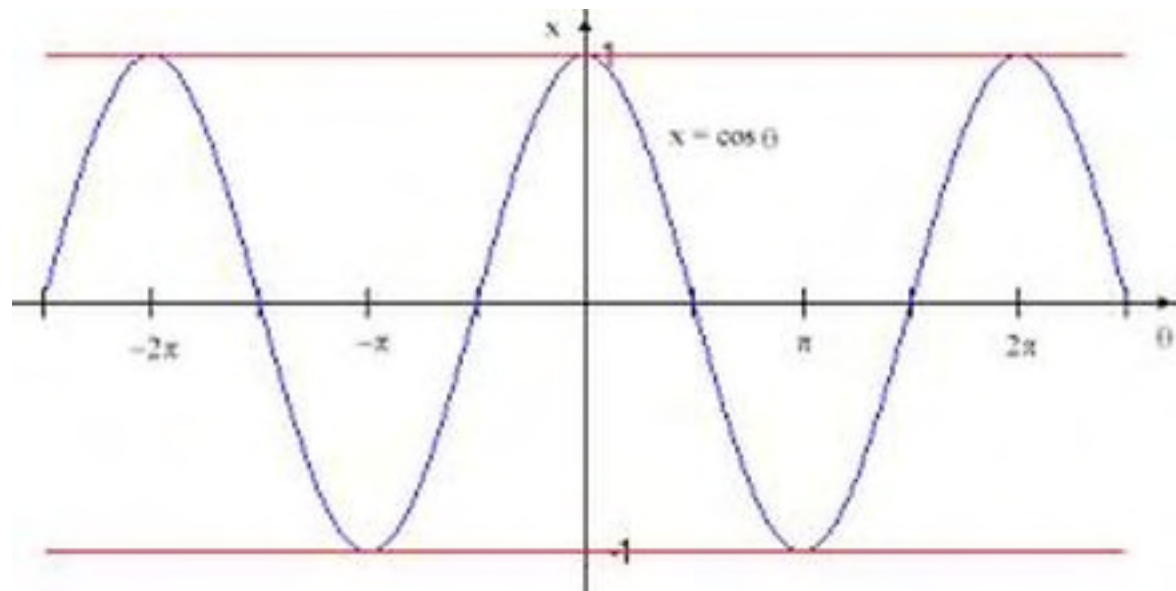


Infrared image (Heat in terms of colors)



Gas Density

# Perceiving



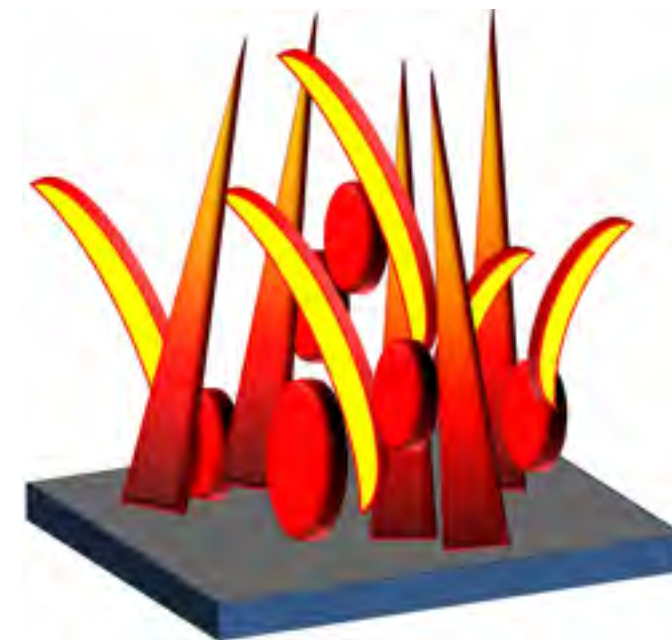
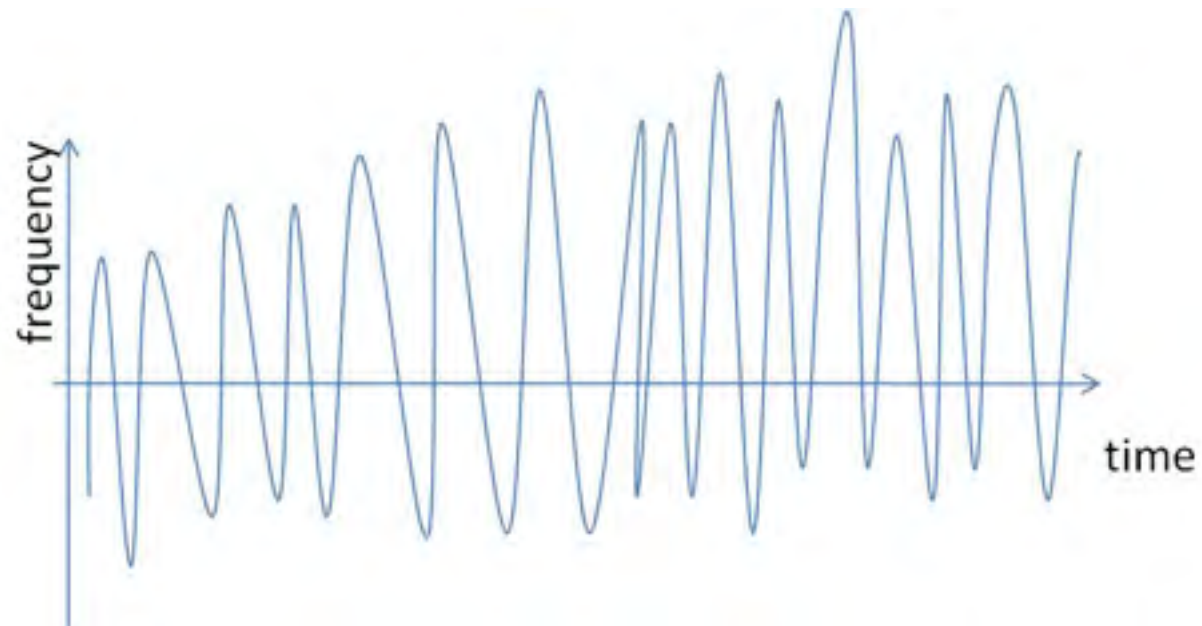
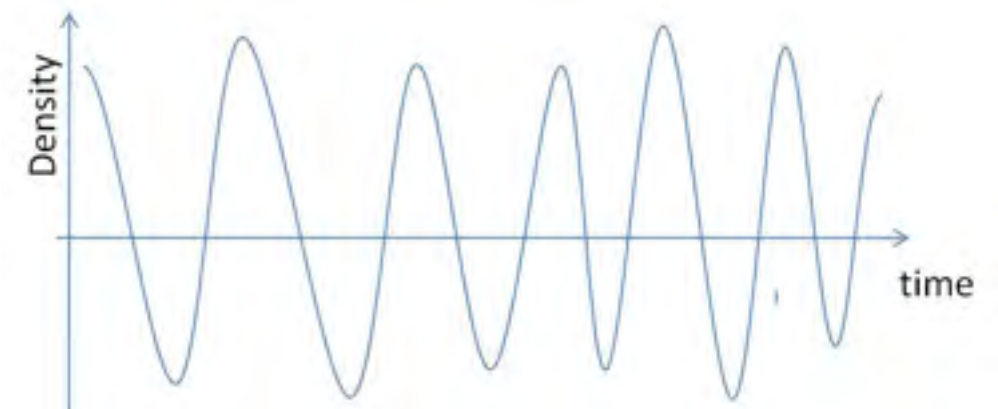
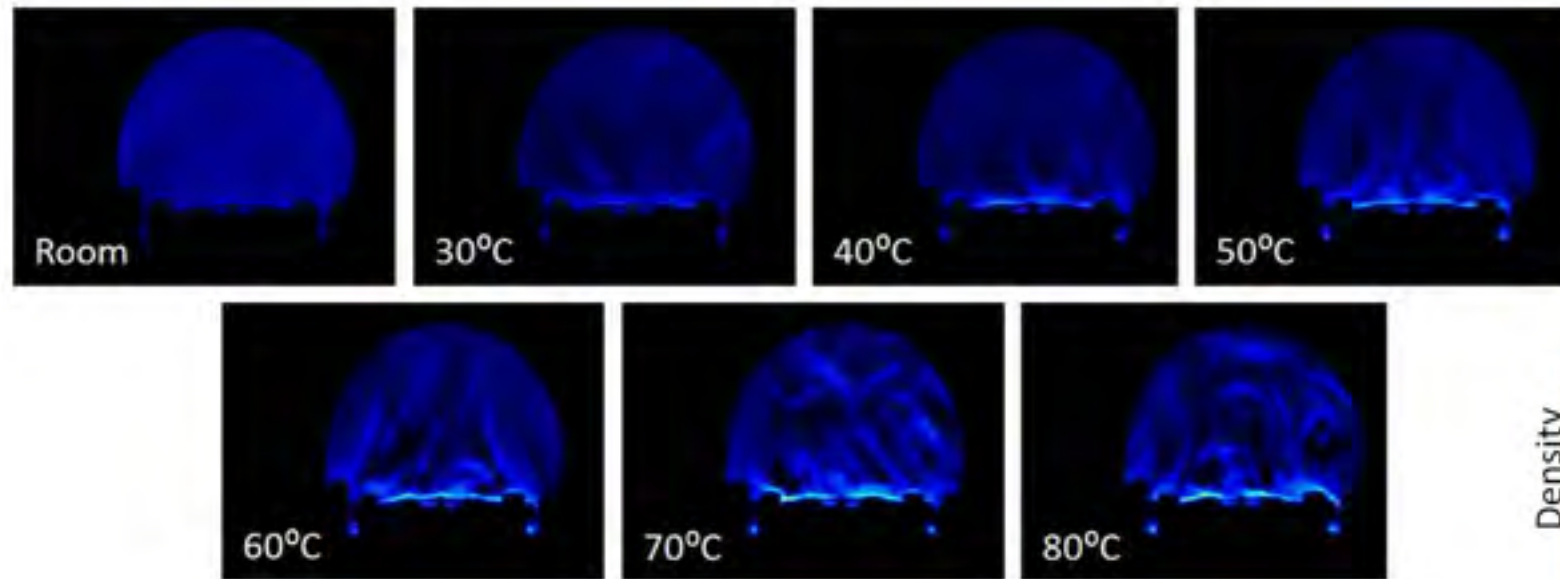
“Perceiving the Cosine graph  $f(x)=\cos(x)$  in everyday objects. Seeing an equation is only one part of a formula. Knowing its meaning allows someone to experience the formula in a different way. Understanding the movement of cosine allowed me and my students to pay attention to things around us and find cosine in our life. Re-imagining it gave all of us a new sense of appreciation and excitement to what was once a common and boring formula”

## 2. Patterning

Identifying a repeating form or a plan in a seemingly arbitrary arrangement of things or processes. Recognizing is an analytical act, forming new patterns is a creative act.



# Patterning



Representing gas density

# Patterning

## Existing Patterns in Poetry

Personification—

Trees

I THINK that I shall never see  
A poem lovely as a tree.

A tree whose hungry mouth is prest  
Against the sweet earth's flowing breast;

A tree that looks at God all day,  
And lifts her leafy arms to pray;

A tree that may in summer wear  
A nest of robins in her hair;

Upon whose bosom snow has lain;  
Who intimately lives with rain.

Poems are made by fools like me,  
But only God can make a tree.

—Joyce Kilmer

Alliteration—While I **n**odded, **n**early **n**apping, suddenly there came a tapping  
(*The Raven*, Edgar Allan Poe)

Assonance—Upon the west **beach** sits the West **Beast**.

**Each beach beast** thinks **he's** the best **beast**.

(*Oh Say Can You Say?* – West Beast East Beast, Dr. Suess)

# Patterning

## **New** Patterns in Poetry

Example:

- 1 Rain
- 2 Drip, Drop
- 3 Like a symphony of hands clapping
- 4 Singing with the wind
- 5 Splish, splash
- 6 Puddle

This example was created using the following figurative language pattern:

- 1 topic
- 2 two onomatopoeias describing line 1
- 3 simile or metaphor
- 4 personification
- 5 two onomatopoeias describing line 6
- 6 related word or topic

“One way for students to better understand how figurative language enhances their perception of a given topic is for them to use a pattern of figurative language examples to form a poem centered on a topic of their choice.”



# 3. Abstracting

Concentrate on one feature of a thing or process, in order to boil it down to basics and grasp its essence.

Key aspect of abstracting is finding **analogies** between seemingly disparate things.

# Abstracting

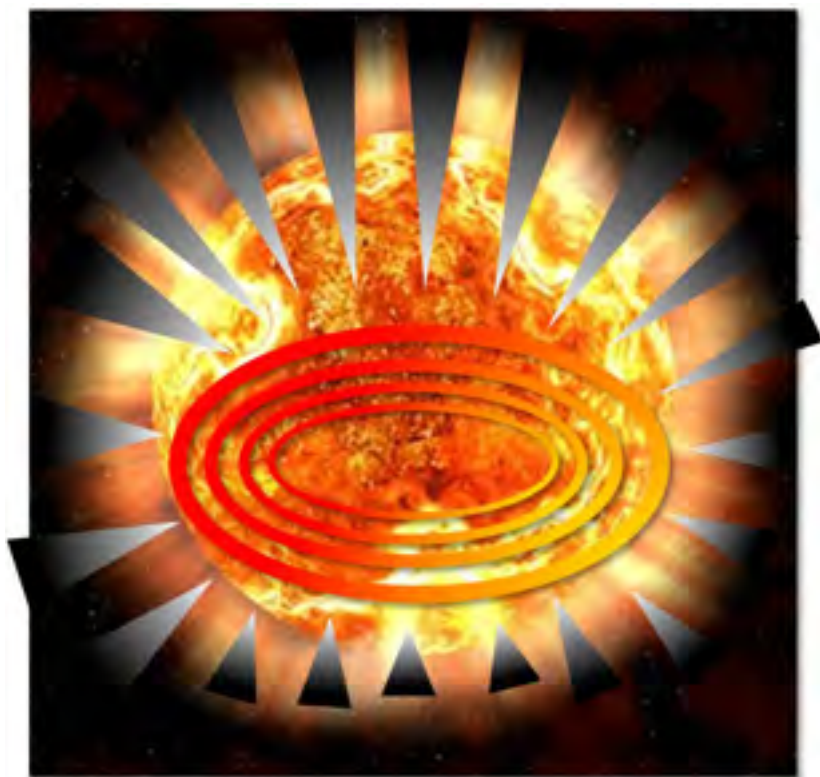


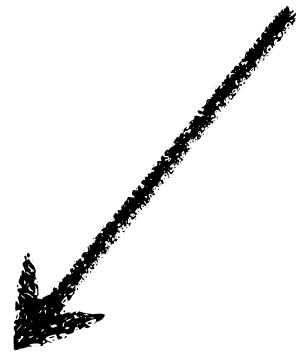
Image 1 is abstractive expression of convection phenomena around the hot stove top. To emphasize the direction of air movements, it has curving lines and circular textures through simplicity in color. Image 2 and 3 are about radiation phenomena. Both of them are heavy in the center and show straight and strong line from the center. It explains that the central objects are the source of energy and this energy emits the light. Also the changing temperature around the stove top is expressed by each different texture.

# Abstracting

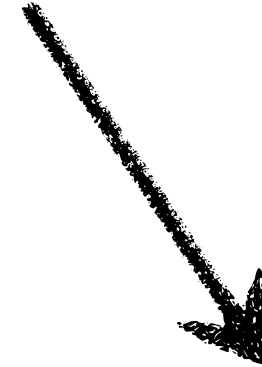
Heat is some thing that spreads with speed that is quite dramatic  
Over all objects and through vacuum the movement is quite b**OLD**  
There is something though that seems to be quite ironi**C**  
How the air in convection seems to just fold and unfold  
Over and over it tumbles in patterns that just look artisti**C**  
Truly masking the fierce heat transfer in a sight to beh**OLD**

# 4. Embodied Thinking

Kinesthetic Thinking & Empathizing



Thinking with the body



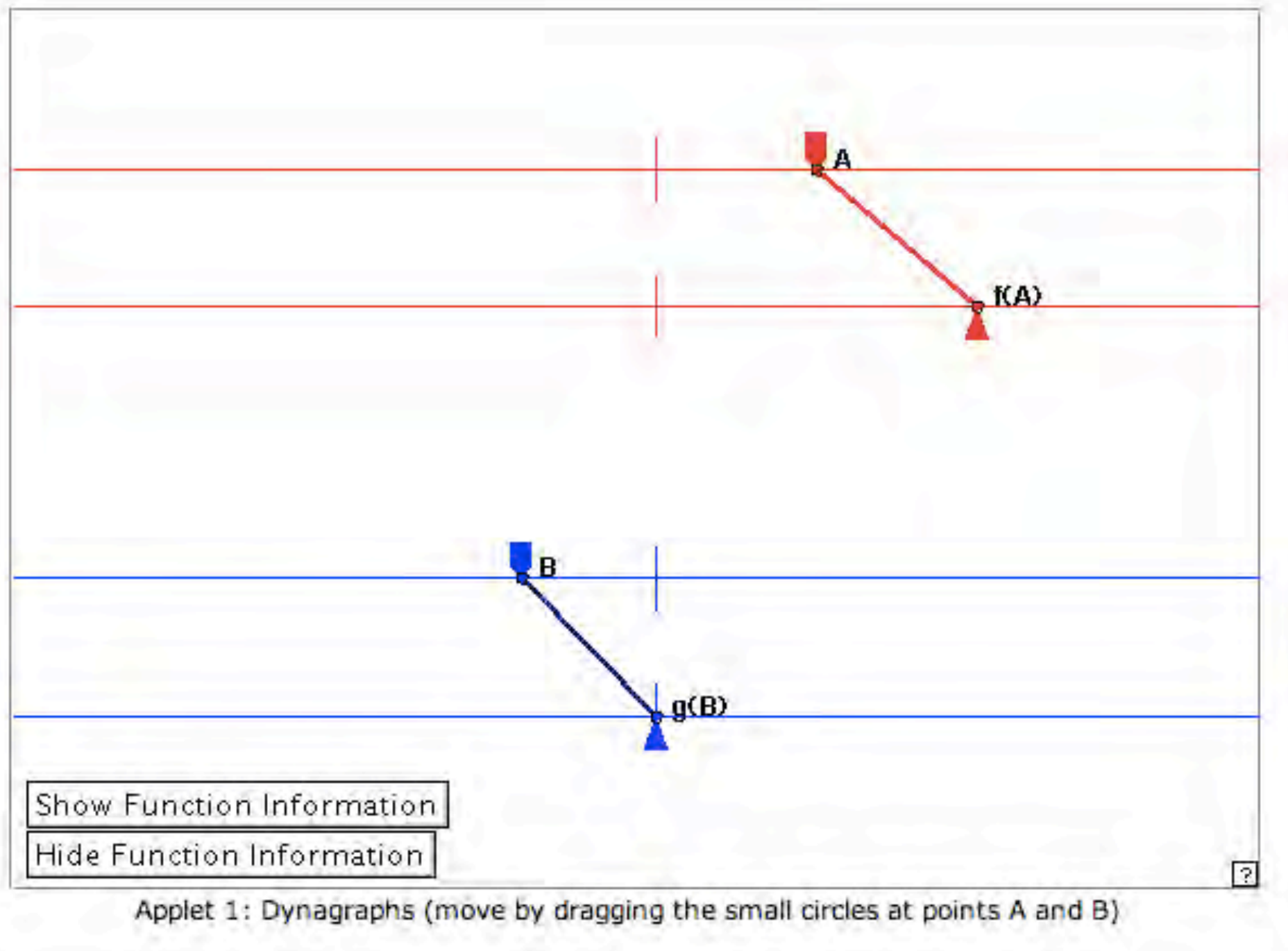
Imagining oneself in  
another's position



# Embodied Thinking

Chinese character 飞 meaning “to fly”





# Dynagraphs



# 5. Modeling

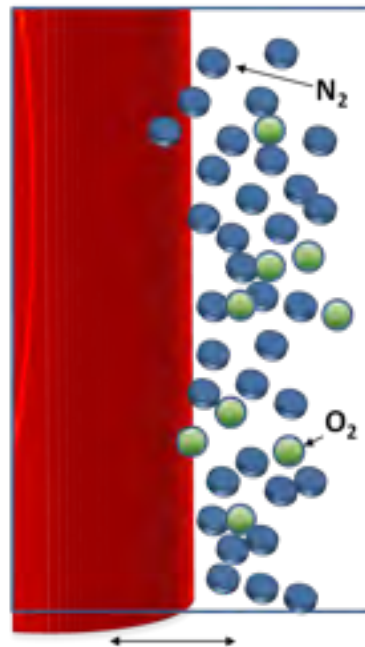
To represent something in real or theoretical terms in order to study its nature, composition or purpose.

# Modeling

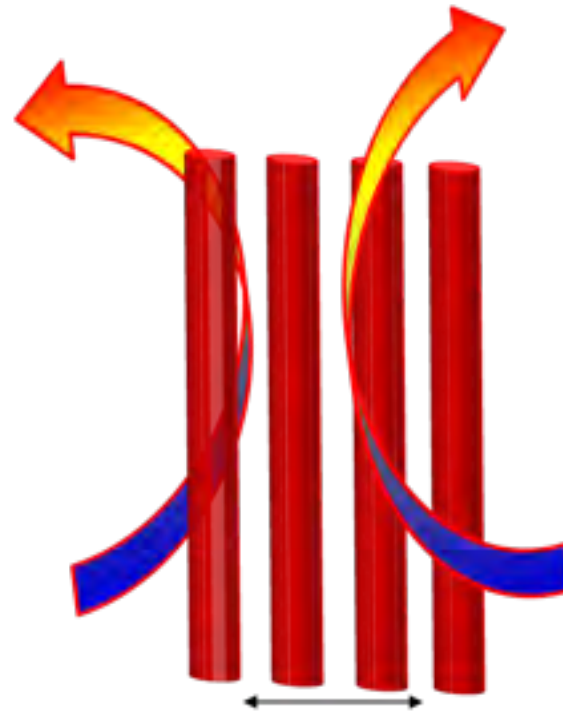


Here is a heat fin on top of a chip for convective heat transfer.  
**LET'S ZOOM IN !!!!!**

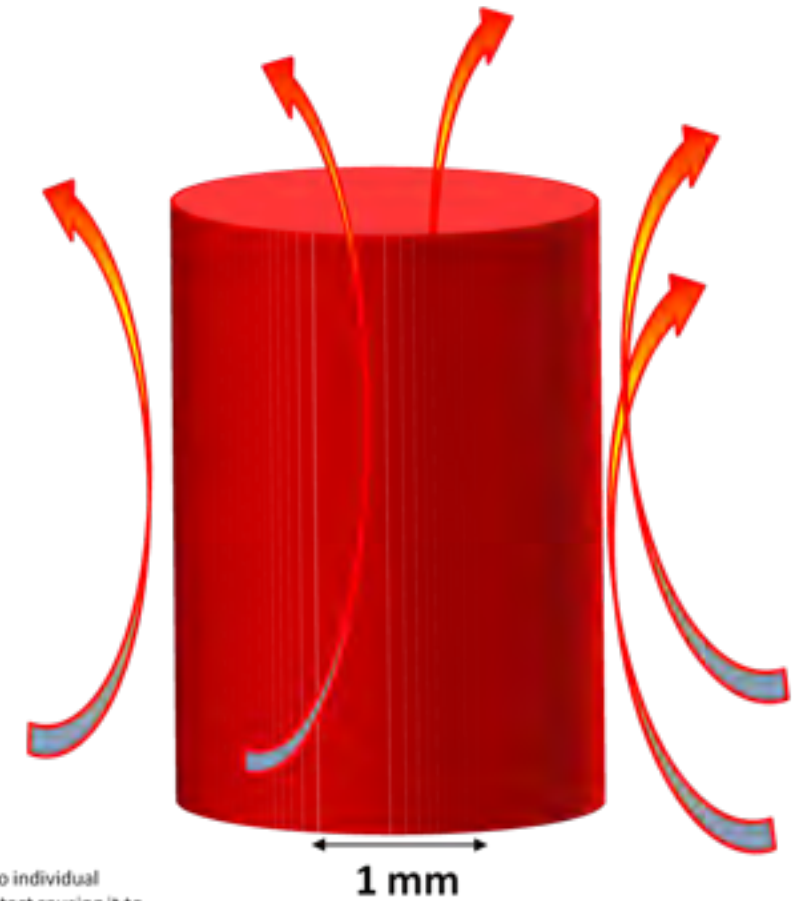
Oxygen and Nitrogen bounce off the fin  
**LET'S ZOOM IN !!!!!**



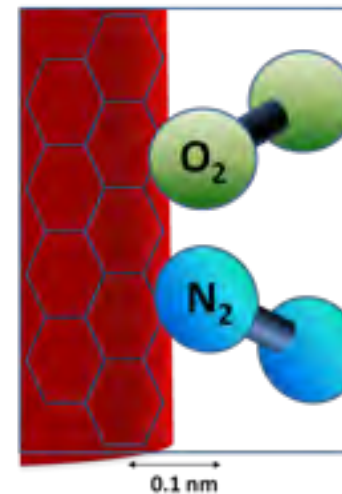
Air is moving around the fins.  
**LET'S ZOOM IN !!!!!**



Air touches the fins and moves up  
**LET'S ZOOM IN !!!!!**

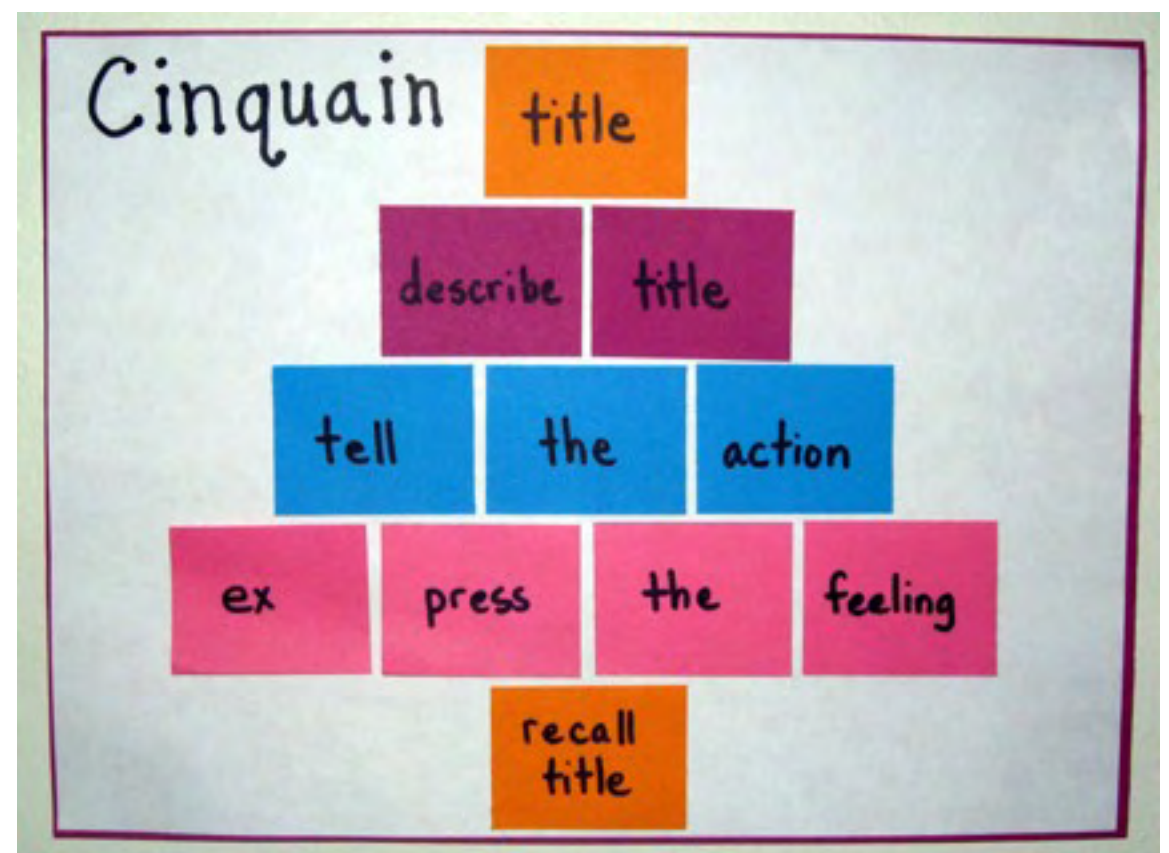
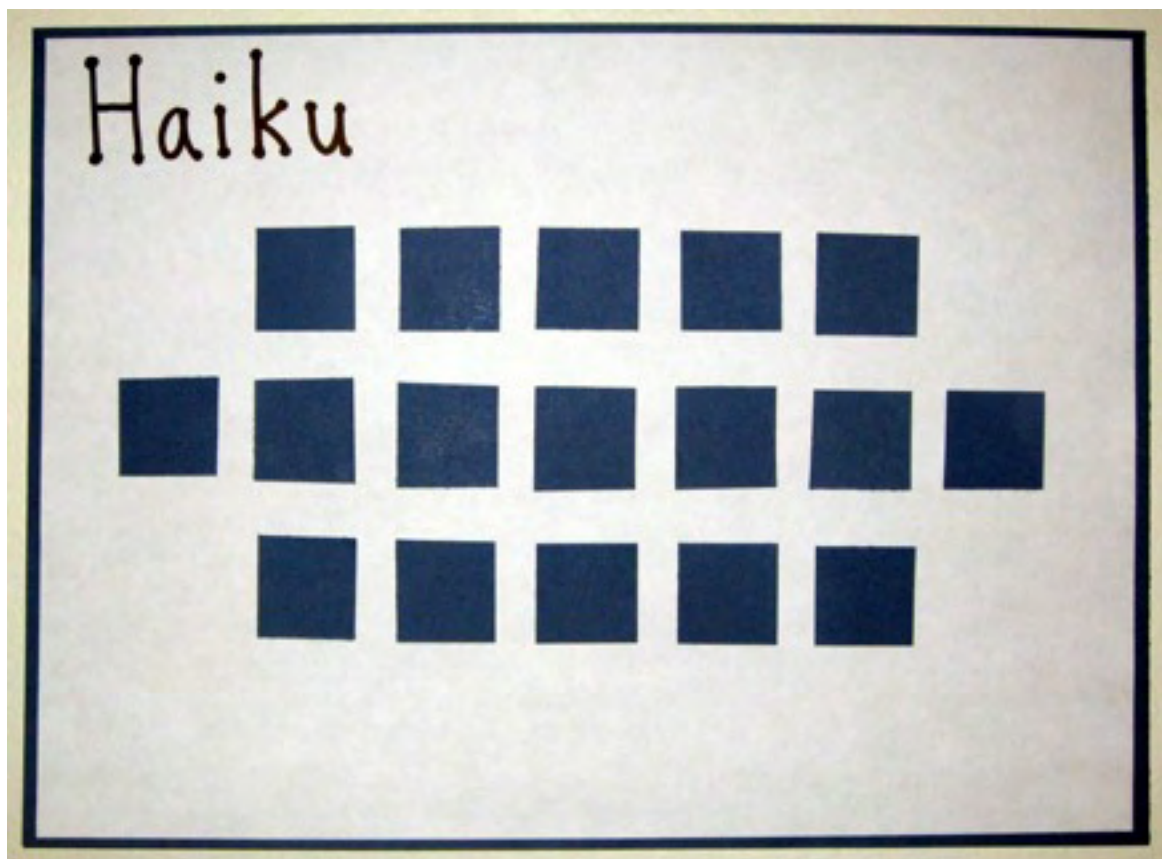


The fin transfers heat to individual molecules through contact causing it to  
**MOVE UP!!!!**



# Modeling

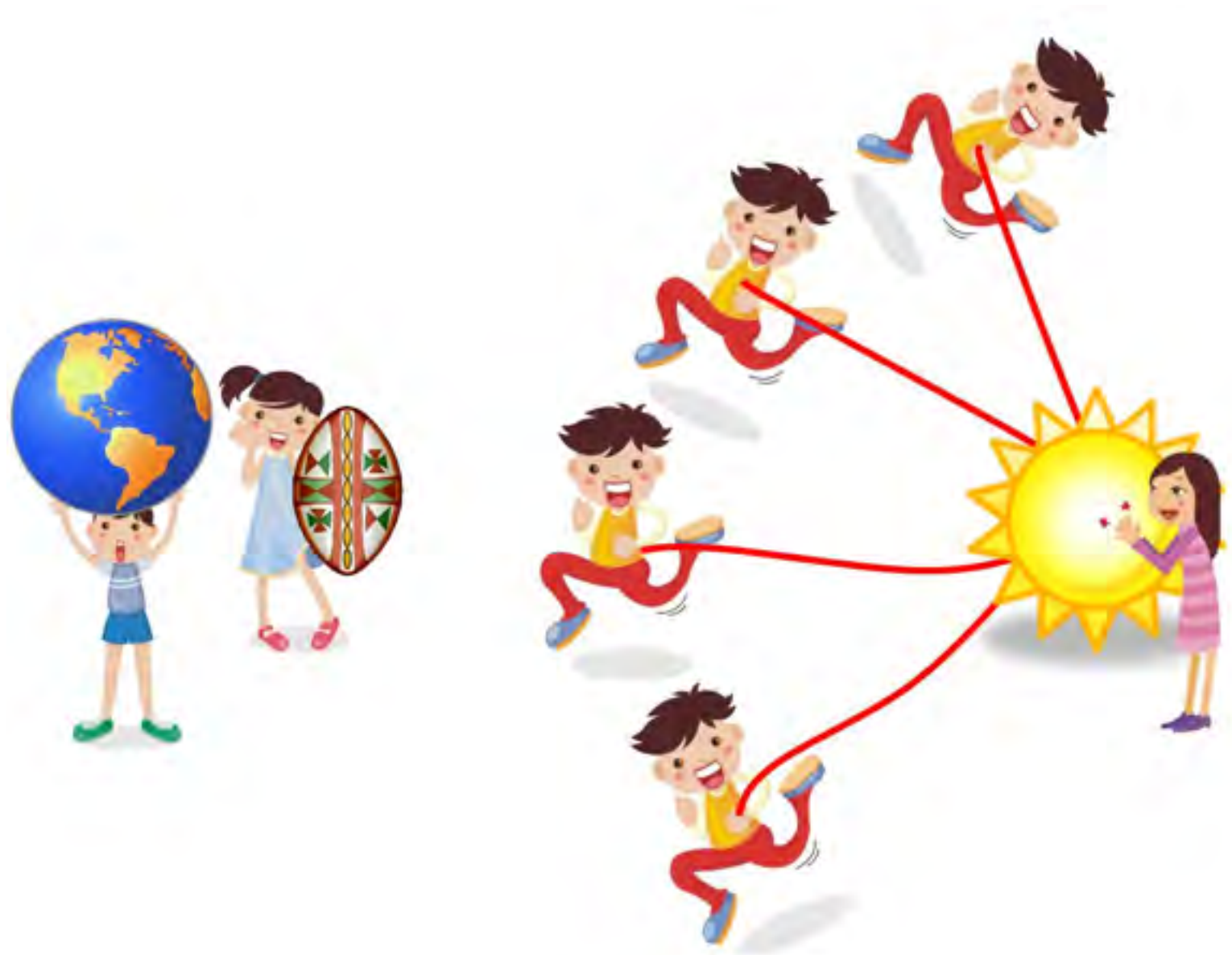
## Modeling poetry conventions



# 6. Playing

Playing is something that we do just “for the fun of it”. Simply put, “play” is using knowledge, body, mind and abilities for the pure enjoyment of using them.

# Playing





# Playing

Playing with photography through  
pictonyms





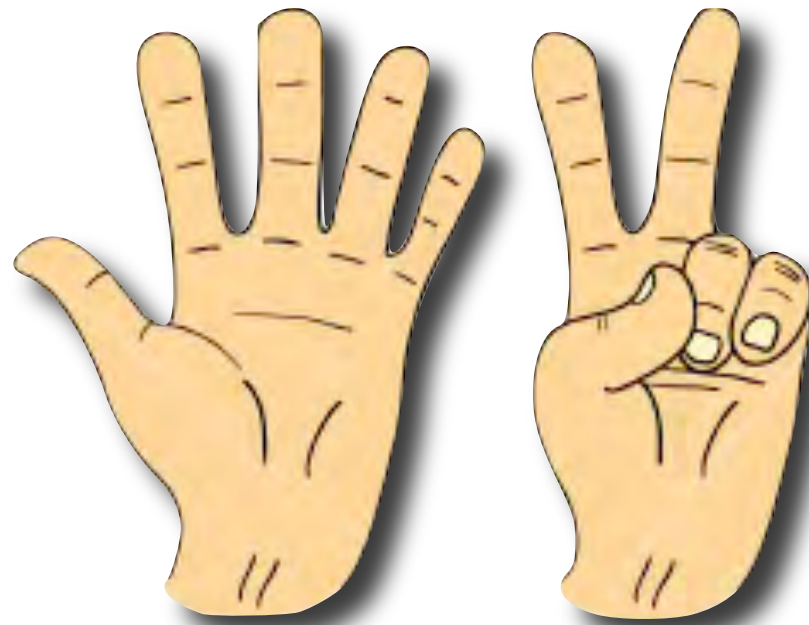
## 7. Synthesizing

Teach children about heat transfer  
using multi-sensory perception.  
Transform complex scientific  
concepts to simple and basic expressions  
<http://bit.ly/bj93>



# Elevator pitch

# White paper

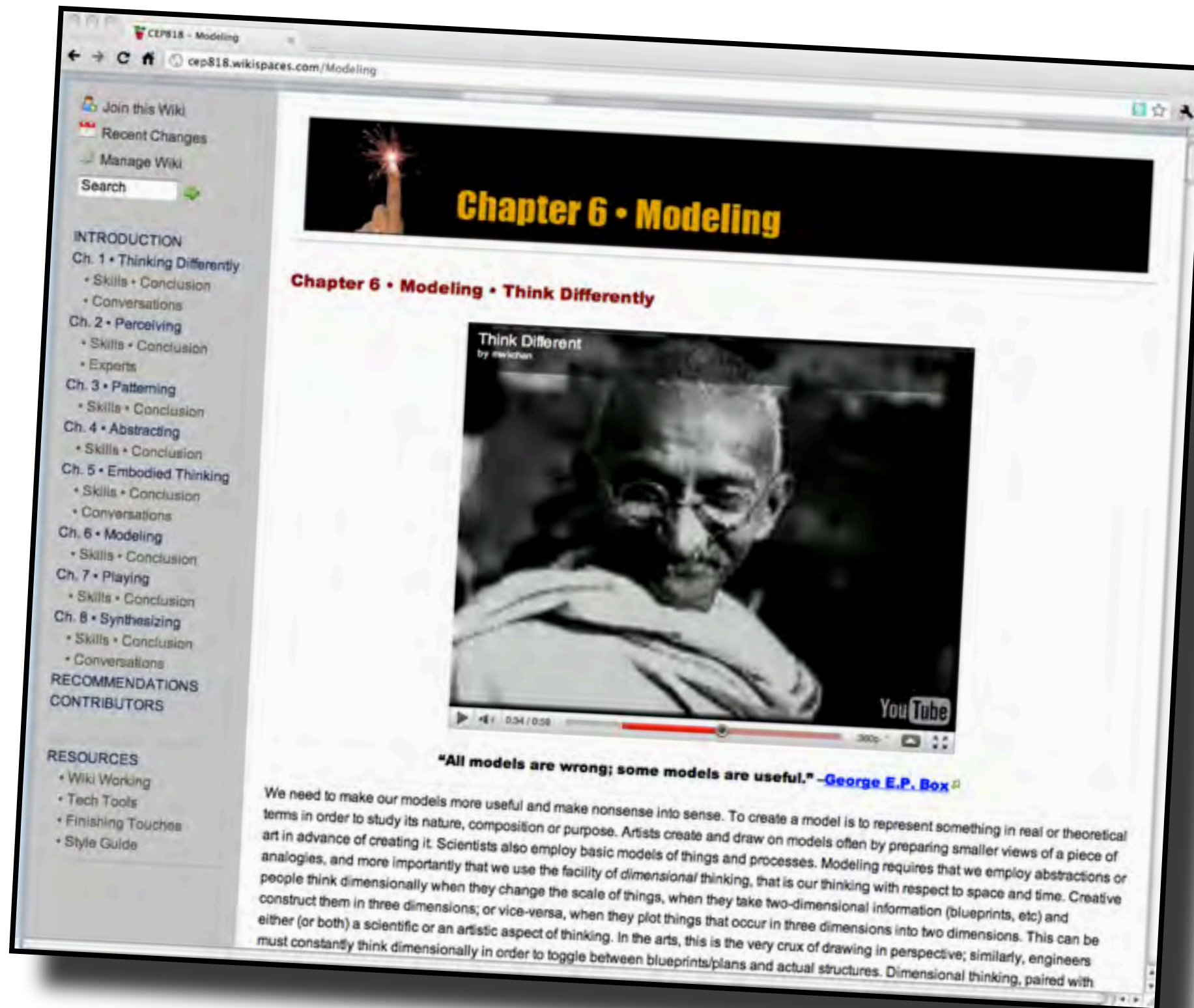


# 7 trans-disciplinary habits of mind (for the 21st Century)

Perceiving | Patterning | Abstracting  
Embodied Thinking | Modeling | Playing | Synthesizing

# Capturing the $\gamma$

# Sparks of Creativity, wiki





# Explore Create Share | database

explore. create. share.

www.msuedtechsandbox.com/MAETVAULT/

Creative Play with Educational Technology About Category Descriptions Contribute

## Explore | CREATE SHARE


Creative Play with Educational Technology

### CREATIVE PLAY WITH EDUCATIONAL TECHNOLOGY

Random Assignment

#### BE THE PROFESSOR, IMAGINE THE FUTURE

Abstract: By building a reading- and activity list for an Educational Technology Course, students get to reflect on what worked, establish priorities, and synthesize learning goals. Description: Now that you have an idea of the required reading list – reconstruct the ultimate year 3 experience. Working on your own, or in groups of two, grab [...]—



#### Building a community for exploring, creating and sharing

This website is intended to be a place where activities and lessons created in the MAET program can be shared openly with anyone. Activities can be taken from this archive and modified for your own use in a class or workshop. It is our hope that as people use and develop new activities and assignments they will contribute them back to this site increasing the volume of activities in the archive and spreading the wealth. Our goal is to create an archive of assignments that offer a range in cognitive tools, content area, duration of activity, and skill level needed to participate in activity.

Search

#### LESSON ARCHIVE

- CEP800 (1)
- [–] Cognitive Tools (86)
  - Abstracting (15)
  - Deep Play (6)
  - Embodied Thinking (7)
  - Modeling (11)
  - Patterning (8)
  - Perceiving (17)
  - Synthesizing (22)
- [+] Content Area (133)
- [+] Courses (57)
- [+] Duration (46)
- [+] Required Skill (63)

#### DESCRIPTIONS

- Category Descriptions

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# Summing up

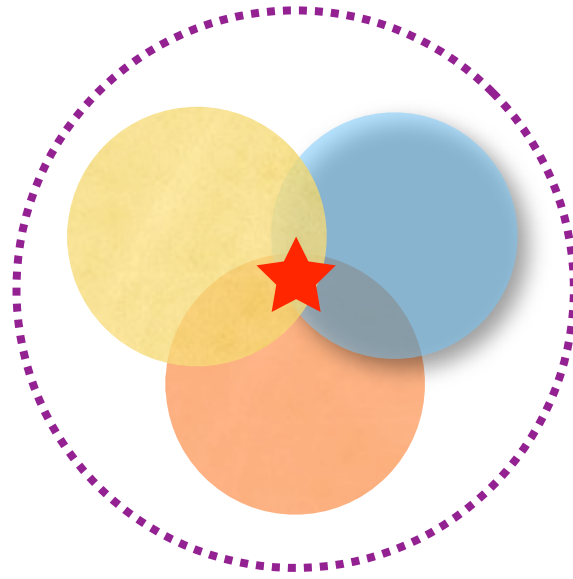


# New ecology

# Standard solutions



Creativity  
Is the **only** solution



Consider the  
Total **PACK**age



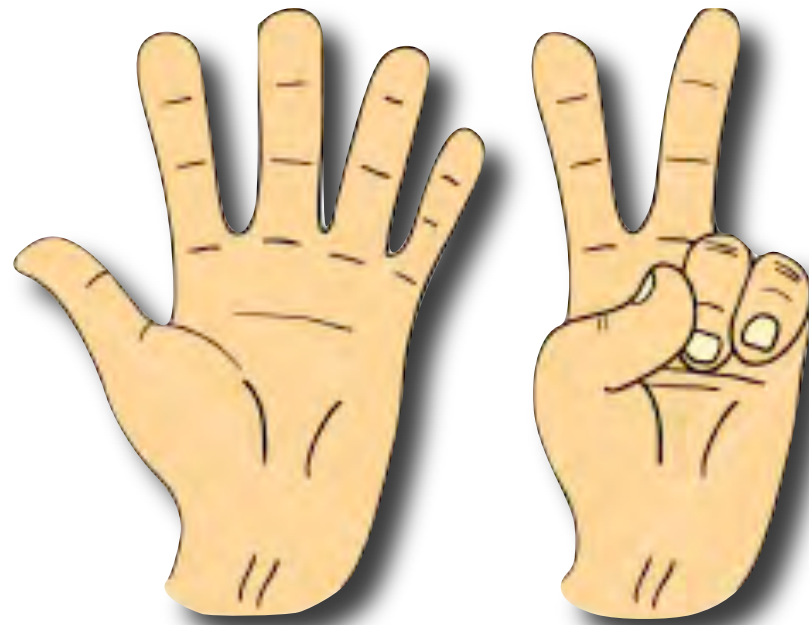


playful process



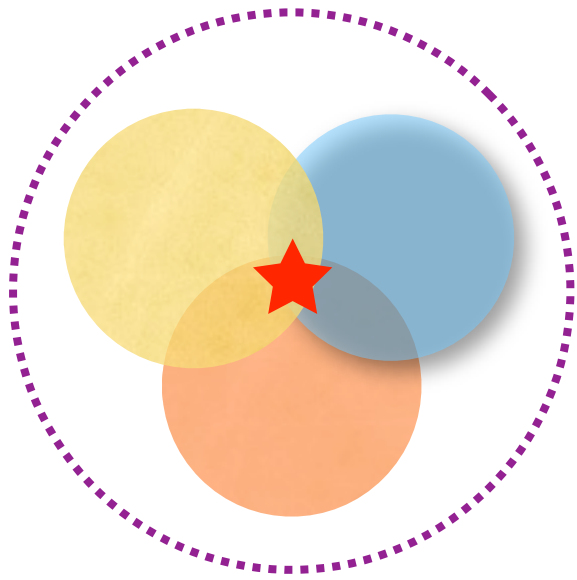
repurposing existing tools

To capture



# 7 trans-disciplinary habits of mind (for the 21st Century)

Perceiving | Patterning | Abstracting  
Embodied Thinking | Modeling | Playing | Synthesizing



# Thank You!

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Stink Different